

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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NXP USA, INC.

Petitioner

v.

BELL SEMICONDUCTOR, LLC

Patent Owner

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Patent No. 7,535,330

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**DECLARATION OF DR. SAYFE KIAEI IN SUPPORT OF PETITION FOR  
*INTER PARTES* REVIEW OF U.S. PATENT NO. 7,535,330**

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I, Sayfe Kiaei, declare as follows:

## **I. INTRODUCTION**

1. My name is Dr. Sayfe Kiaei. I am a professor at Arizona State University. I have been retained by NXP USA, Inc. (“Petitioner”) as an independent expert consultant in this proceeding before the United States Patent and Trademark Office (“PTO”) regarding U.S. Patent No. 7,535,330 (“the ’330 Patent”) (Ex. 1001).<sup>1</sup> I have been asked to consider whether certain references disclose or suggest the features recited in claims 1-20 of the ’330 Patent. My opinions are set forth below.

2. I am being compensated at a rate of \$475/hour for my work in this proceeding. My compensation is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no interest in this proceeding.

## **II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE**

3. My qualifications are stated more fully in my curriculum vitae, which is attached as Exhibit 1003. Below is a summary of my education, work experience, and other qualifications.

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<sup>1</sup> Where appropriate, I refer to exhibits that I understand are to be attached to the petition for *Inter Partes* Review of ’330 Patent.

4. I earned a Ph.D. in 1987 from Washington State University in Electrical, Computer, and Energy Engineering. From 1985 through 1987, while working toward my Ph.D., I worked with Boeing on the development of signal processing and control systems.

5. From 1987 through 1993, I was a tenured Professor at Oregon State University in the Electrical and Computer Engineering Department.

6. From 1993 to 2002, I was a Senior Member of Technical Staff with the Wireless Technology Center and Broadband Operations at Motorola Inc., where I was responsible for the development of wireless system, cellular system, RF integrated circuits, GPS, and Digital Subscriber Lines (DSL) transceivers.

7. Since 2001 I have held the position of Motorola Endowed Chair Professor in Analog and Radio Frequency Integrated Circuitry at the School of Electrical, Computer, and Energy Engineering at Arizona State University in Tempe, Arizona. I am also the Director of the National Science Foundation Center, Connection One. Connection One is an industry/university cooperative research center with over thirty industrial members and five university members focused on developing communication systems, sensors, electronics, bioelectronics, and networking technologies.

8. At Arizona State University, I have developed and taught courses on Wireless and RF Transceivers, Electronics, VLSI, Analog IC design, RFIC, communications, and related areas. In my over thirty years of academic experience, I have taught university courses and done research in electronics, RF and wireless system, bioelectronics, networking, communication systems, and sensors.

9. I have graduated over 100 M.S. and Ph.D. students working under my supervision on their thesis, and many of them are professors in academia, or have senior positions in the industry. Currently, I have 8 M.S., Ph.D., and postdoc students working with me in my lab on research related to communication and networking systems, wireless systems, RF, and integrated circuits. My research is funded by various sources, including industry, federal agencies including NSF, DARPA, ONR, DOE, and others, with an average total research funding of \$1M per year.

10. I have published over two hundred journal and conference papers covering topics such as wireless systems, power management, low-power electronics, sensors, radio frequency, integrated circuits (IC), filter design, and related areas. A list of my publications can be found in my CV, attached as Exhibit 1003. I also have over 10 patents and patent applications in electronics, RF, and low-power bioelectronics.

11. I am an IEEE Fellow, a distinction and the highest level of IEEE membership awarded by the IEEE directors to recognize a high level of demonstrated extraordinary accomplishments. The IEEE is the Institute of Electrical and Electronics Engineers, the world's largest association of technical professionals whose objectives include the educational and technical advancement of electrical and electronic engineering, telecommunications, computer engineering, and related disciplines. I am a member of the IEEE Circuits and Systems Society, IEEE Solid State Circuits Society, and IEEE Communication Society, IEEE RF and Microwave committees, IEEE International Symposium on Low Power Electronics and Design (ISLPED), IEEE Signal Processing Society, IEEE Fellow Selection Committee, and many other International Electrical Engineering societies. I was one of the key organizers to establish the IEEE Radio Frequency Integrated Circuits (RFIC) symposium in 1995, and IEEE International Symposium on Low Power Electronics and Design (ISLPED) in 1997. I have been on the executive committee, and technical committee of RFIC and ISLPED for the last 16 years. The RFIC and ISLPED Symposia have grown and is now the premier international symposium in the world where the latest RF, low-power electronics, wireless, and bio-electronic circuits, and components are presented.

12. I have received several awards including the Carter Best Teacher Award, the IEEE Darlington Award (which is given for the best technical paper on circuits and systems in the IEEE Circuits and Systems Society), and the Motorola 10X Rapid Design Cycle Reduction Award.

13. I have been one of the key organizers of the IEEE International Symposium on Low Power Electronics and Design (ISLPED) since 1997. I have published papers and organized sessions on techniques for low-power cellular phones at ISLPED. I have published a number of papers on the design and development of low-power RF, wireless transceivers, sensors, and low-power bioelectronics.

14. I have also been a consultant on various projects with Intel (designing 2G, 3G mobile telephone transceivers, Internet-of-Things (IOT), and sensors), Texas Instrument (developing 3G cellular and Bluetooth technologies), Sony Wireless (developing GPS technologies), Tektronics (designing wireless systems), and various other consultancies. During my work in industry, I have designed and contributed to the design of many wireless systems for commercial products. Many of my designs are still in use today in products manufactured by the companies I have worked for, including Motorola, Intel, Sony, and more.

15. I am not an attorney and offer no legal opinions, but in the course of my work, I have had experience studying and analyzing patent claims from the perspective of a person skilled in the art.

### **III. MATERIALS CONSIDERED**

16. The opinions in this Declaration are based on the documents I reviewed, my knowledge and experience, and professional judgement. In forming my opinions expressed in this Declaration, I have reviewed the following materials: U.S. Patent No. 7,535,330 (Ex.1001); the prosecution history of U.S. Patent No. 7,535,330 (Ex.1004); U.S. Patent No. 7,955,886 to Marques (“Marques”) (Ex. 1005); JR Lucas, “Resonance & Mutual Inductance,” University of Maratuwa (Nov. 2001) (“Lucas”) (Ex. 1006); THOMAS A. LEE, THE DESIGN OF CMOS RADIO-FREQUENCY INTEGRATED CIRCUITS 387-90 (2d ed. 2004) (“Lee”) (Ex. 1007); U.S. Patent No. 7,221,251 to Menegoli *et al.* (“Menegoli”) (Ex. 1008); RON SCHMITT, ELECTROMAGNETICS EXPLAINED (1st ed. 2002) (“Schmitt”) (Ex. 1009); ANANT AGARWAL AND JEFFERY H. LANG, FOUNDATIONS OF ANALOG AND DIGITAL ELECTRONIC CIRCUITS (2005) (“Agarwal”) (Ex. 1014); Special Master Report and Recommendation on Claim Construction, *Bell Semiconductor, LLC vs. NXP USA, INC., et al.* 8:22-cv-02133-HDV-ADS (C.D. California) (October 16, 2023) (Ex.

1015); and any other materials I refer to in this Declaration in support of my opinions.

17. The opinions contained in this Declaration are based on the documents I reviewed and my knowledge and professional judgment. My opinions have also been guided by my appreciation of how a person of ordinary skill in the art would have understood the claims and the specification of the '330 Patent at the time of the alleged invention, which I have been asked to initially consider as the early 2000s (including September 22, 2006, the filing date of the '330 Patent, which I understand is the earliest possible priority date for the '330 Patent). My opinions reflect how one of ordinary skill in the art would have understood the '330 Patent, the prior art to the '330 Patent, and the state of the art at the time of the alleged invention.

18. Based on my experience and expertise, it is my opinion that certain prior art references disclose or suggest all the features recited in claims 1-20 of the '330 Patent, as I discuss in detail below.

#### **IV. LEGAL PRINCIPLES**

19. I am not an attorney. For the purposes of this Declaration, I have been informed by NXP Inc.'s counsel about certain aspects of the law that are relevant to my analysis, as stated in the following paragraphs. I have applied these legal principles in arriving at my conclusions expressed in this Declaration.

20. I have been informed and understand that for an invention to be patentable, it must be novel (i.e., not “anticipated”). Second, it must not be obvious. An invention is anticipated if a single prior art reference, such as a patent or publication, discloses all the elements of the claimed invention. An anticipating reference need not expressly disclose all the elements of the claimed invention, but rather may do so inherently. A prior art reference inherently anticipates if it “necessarily” leads to the claimed invention.

21. While anticipation requires that all elements of the invention be disclosed expressly or inherently in a single prior art reference, obviousness permits the elements of the invention to be found among several prior art references. An invention may be obvious if a combination of prior art references—or a single prior art reference combined with the knowledge of a person of ordinary skill in the art (“POSITA”)—discloses all elements of the claimed invention. This means that, even if all the requirements of a claim are not found in a single prior art reference, the claim is not patentable if the differences between the subject matter in the prior art and the subject matter in the claim would have been obvious to a POSITA at the time of the alleged invention.

22. I understand that in order for a prior art reference to be used to render a claimed invention obvious, the reference must be analogous to the claimed

invention. A reference is analogous art to the claimed invention if: (1) the reference is from the same field of endeavor as the claimed invention (even if it addresses a different problem); or (2) the reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention).

23. I have been informed and understand that a determination of whether a claim would have been obvious should be based upon several factors, including, among others: (1) the level of ordinary skill in the art at the time of the alleged invention; (2) the scope and content of the prior art; (3) the differences, if any, that existed between the claimed invention and the prior art; and (4) any objective considerations of non-obviousness.

24. I have been informed and understand that when determining any differences between the invention covered by the patent claims and the prior art, one should not look at the individual differences between the patent claims and the prior art in isolation, but rather consider the claimed invention as a whole and determine whether it would have been obvious in light of all of the prior art.

25. I have been informed and understand that a single reference can render a patent claim obvious if any differences between that reference and the claims would have been obvious to a POSITA. Alternatively, the teachings of two or more

references may be combined in the same way as disclosed in the claims. I have been informed and understand that when deciding whether to combine the various items described in the prior art, the relevant question is whether the prior art combination would have been obvious to a POSITA at the time of the invention. I have been further informed that it can be important to identify a teaching, suggestion, or motivation, in either the prior art or the knowledge of persons skilled in the art, that would have prompted a person of ordinary skill in the relevant field to combine the elements in the prior art in the way the claimed invention does.

26. In determining whether a combination based on either a single reference or multiple references would have been obvious, it is appropriate to consider, among other factors:

- whether the teachings of the prior art references disclose known concepts combined in familiar ways, and when combined, would yield predictable results;
- whether a POSITA would implement a predictable variation, and would see the benefit of doing so;
- whether the claimed elements represent one of a limited number of known design choices, and would have a reasonable expectation of success by a POSITA;

- whether a POSITA would have recognized a reason to combine known elements in the manner described in the claim;
- whether there is some teaching or suggestion in the prior art to make the modification or combination of elements claimed in the patent; and
- whether the innovation applies a known technique that had been used to improve a similar device or method in a similar way.

27. I have been informed and understand that one of ordinary skill in the art has ordinary creativity and is not an automaton. I have been informed and understand that in considering obviousness, it is important not to determine obviousness using the benefit of hindsight derived from the patent being considered. I have been informed and understand that a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was independently known in the prior art.

28. I have been informed and understand that to show a motivation to combine, one is not required to show how the references would be physically combined to render a claim obvious. The analysis is not focused on whether the features of one reference can be physically incorporated into the structure of another reference, but rather whether a person of ordinary skill in the art would have been motivated to combine the teachings of the references to achieve the claimed

invention. For example, a person of ordinary skill in the art would understand how predictable variations of known concepts could be combined and would recognize that where multiple tools were available in a “toolbox” of a POSITA, any tool could be chosen.

## **V. LEVEL OF ORDINARY SKILL IN THE ART**

29. I am familiar with the level of ordinary skill in the art with respect to the alleged inventions of the '330 Patent as of what I understand is the earliest possible priority date of September 22, 2006. Specifically, based on my review of the '330 Patent, the technology, the educational level and experience of active workers in the field, the types of problems faced by workers in the field, the solutions found to those problems, the sophistication of the technology in the field, and drawing on my own experience, I believe a person of ordinary skill in the art for the '330 Patent would have had at least the equivalent of a bachelor's degree in electrical engineering and one to two years of experience in the field of circuit design, particularly the design of circuits operating at high frequencies. This level of skill in the art is appropriate because many circuitry concepts (e.g., circuitry components such as inductors, electromagnetic concepts, common circuits such a differential low noise amplifiers (DLNAs), etc.) are well known and widely taught in undergraduate courses. Moreover, an additional one to two years of experience in the industry

would give one of ordinary skill in the art experience with how such systems are implemented in the real world. Before September 22, 2006, which is the claimed priority date of the '330 Patent, I would have qualified at least as a POSITA under this standard.

## **VI. TECHNICAL BACKGROUND**

30. In this section, I present a brief overview the state of the art relevant to the subject matter of the '330 Patent, as would have been known, understood, and appreciated by a POSITA at the time of the alleged invention of the '330 Patent. A POSITA would have been aware of basic electromagnetic concepts such as magnetic field interference and mutual inductance as well as issues such as parasitic inductance in high frequency circuits.

### **A. Magnetic Field Fundamentals**

31. The direction of a magnetic field depends on which direction current flows. (Ex. 1009, 53<sup>2</sup>.) As shown in Figure 3.3 below, the “right hand rule” illustrates the relationship between current and magnetic field direction. (*Id.*) With thumb pointed in the direction of current (I), curling the rest of your fingers to form

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<sup>2</sup> Citations are to page numbers of RON SCHMITT, ELECTROMAGNETICS EXPLAINED (1st ed. 2002) (“Schmitt”) that are on the top or bottom of each page.

a semicircle demonstrates the direction of the magnetic field ( $B$ ) in relation to the current. (*Id.*) As such, magnetic fields have polarity. Thus, magnetic fields of the same polarity add, and magnetic fields of opposite polarity subtract.

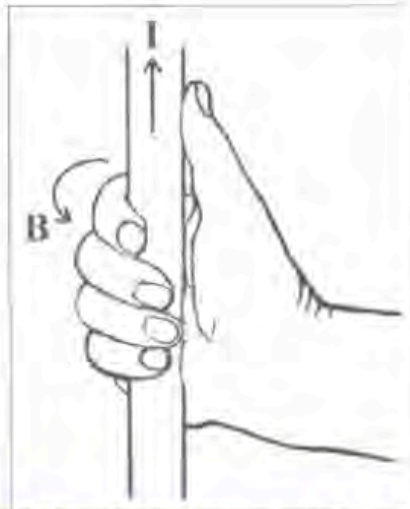


**Figure 3.3** The right hand rule: the magnetic field ( $B$ ) curls like the fingers of the hand around the current ( $I$ ), which points in the direction of the thumb.

(*Id.*, Figure 3.3.)

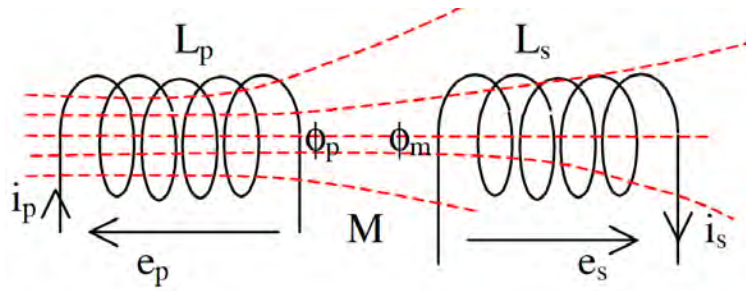
## **B. Mutual Inductance**

32. Mutual coupling between coils exists when one coil is in the magnetic field created by another coil, as shown in the figure below. (Ex. 1006, 8<sup>3</sup>.) When a

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<sup>3</sup> Citations are to page numbers of JR Lucas, “Resonance & Mutual Inductance,” University of Maratuwa (Nov. 2001) (“Lucas”) that are on the bottom of each page.

varying alternating current (AC)  $i_p(t)$  flows in the primary winding  $L_p$ , then a varying magnetic flux  $\phi_p$  is produced in the same coil and produces an electromagnetic field (emf)  $e_p(t)$ . (*Id.*) The flux  $\phi_p$  produced in the first coil is proportional to the current  $i_p$  producing the flux. (*Id.*) Part of the primary flux near the second coil  $L_s$  is the mutual flux  $\phi_m$ . (*Id.*) The mutual magnetic field interacts with the second coil  $L_s$  generating alternating current  $i_s$  in the second coil. (*Id.*) Since the mutual flux  $\phi_m$  will also be varying, an induced emf  $e_s$  and current  $i_s$  will be produced in the second coil  $L_s$  which will also be proportional to the current  $i_p$ . (*Id.*)



(*Id.*)

33. The induced emf  $e_s$  in the second coil will be proportional to the rate of change of the current in the primary coil, with the constant of proportionality being defined as the mutual inductance  $M_{sp}$  (equation provided below where  $N_s$  is the number of turns of the coil  $L_s$  and  $k$  is the coupling coefficient). (*Id.*)

$$\text{i.e. } e_s \propto \frac{di_p}{dt} = M_{sp} \frac{di_p}{dt}, \quad \text{where } M_{sp} = \frac{N_s \phi_m}{i_p} = \frac{k N_s \phi_p}{i_p}$$

(*Id.*)

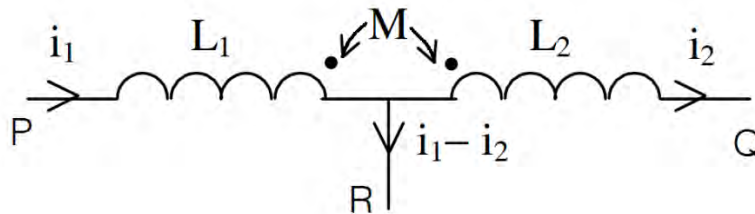
34. Coils can either be connected so that fluxes aid each other (first example below) or connected such that the fluxes oppose each other (second example below). (*Id.*, 10.)

*Equivalent inductance of 2 mutually coupled coils in series*



(*Id.*)

35. The relative direction of coils is sometimes defined by dotted ends (i.e., dot notation). (*Id.*, 11.) A pair of mutually coupled, oppositely wound coils are shown below (where the opposite winding is indicated by the dotted ends). (*Id.*, 14.) A current  $i_1$  flows through an inductor  $L_1$  and a current  $i_2$  flows through an inductor  $L_2$ . A common branch between the inductors has a current equal to  $i_1 - i_2$ . (*Id.*) The current  $i_1$  leaves the dotted end of  $L_1$ , while the current  $i_2$  enters the dotted end of  $L_2$ , so that the sign associated with mutual inductance is negative. (*Id.*)



(*Id.*)

**C. Parasitic Inductance in High-Speed Circuits**

36. In the 2002 textbook entitled, “Electromagnetics Explained: A Handbook for Wireless/RF, EMC, and High-Speed Electronics” by Ron Schmitt, the author discusses that technical advancements in the 21<sup>st</sup> century have led to high frequency circuits and components which has made knowledge of electromagnetic fields crucial for circuit designers. (Ex. 1009, 1-2.) With the advancement of integrated circuit (IC) technology fabrication, circuits are fabricated in micro and nanometer devices on the chip. Given the proximity of the circuits within the same IC chips only a few nanometers apart from each other, high-speed signals from one circuit can interfere with other circuits within the same IC package (i.e., crosstalk).

(*Id.*, 2)

37. Furthermore, nearby lines and circuits couple with each other due to the parasitic capacitances and inductances between circuits and lines. At high frequencies, these parasitic impedances cause real components such as inductors to behave differently. (*Id.*, 139.) Further, nearby signal line induced interference is dependent on frequency. (*Id.*, 256.) Effects induced into a second circuit are proportional to how fast the field changes (i.e., proportional to the time derivative of

the field). (*Id.*) Therefore, near-field interference increases with larger fields, higher frequencies, and shorter distances. (*Id.*)

## **VII. OVERVIEW OF THE '330 PATENT**

38. The '330 Patent is entitled "Low Mutual Inductance Matched Inductors." (Ex. 1001, Title.) The '330 Patent discloses inductor structures and methods where oppositely wound inductors are positioned to cause magnetic field cancellation and reduction in parasitic mutual inductance. (*Id.*, Abstract.) The '330 Patent describes structures and methods for reducing the mutual inductance between inductors. (*Id.*) The background section of the '330 Patent describes how magnetic fields produced by inductors can cause electromagnetic interference between inductors reducing the electrical performance of each other through parasitic mutual inductance. (*Id.*, 1:25-30.) Thus, in prior art systems, inductors are typically separated by enough distance to reduce electromagnetic interference. (*Id.*, 1:33-37.) As shown in Figure 1 below, cross coupling between inductors occurs when the inductors are physically close. (*Id.*, 1:39-41.)

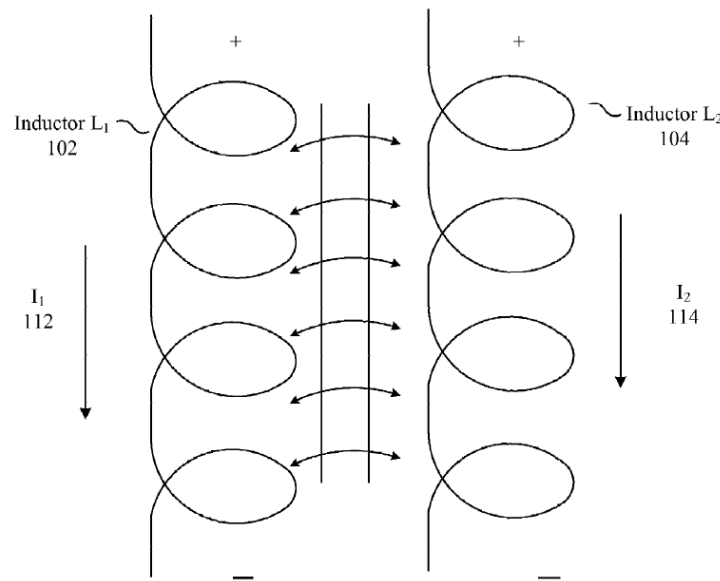


Figure 1

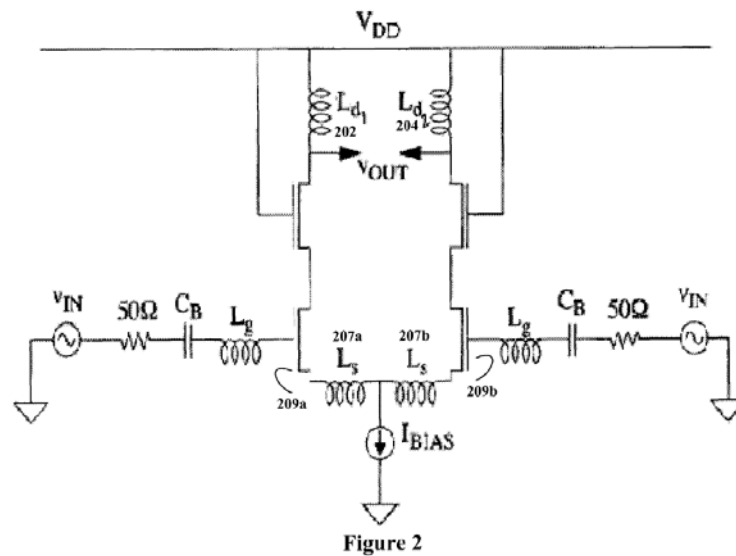
(*Id.*, Figure 1.)

39. The polarity of the inductors,  $L_1$  and  $L_2$  of Figure 1 are symmetrical and currents  $I_1$  and  $I_2$  are flowing through the inductors in the same direction. (*Id.*, 1:41-44.) As such, the magnetic field produced in the first inductor interferes with the magnetic field produced in the second inductor resulting in a larger magnitude magnetic field. (*Id.*, 1:48-52.)

40. The background section of the '330 Patent further provides that inductor interference is a potential issue in circuits requiring multiple inductors such as differential low noise amplifiers ("DLNAs"). (*Id.*, 1:58-63.) Figure 2 below depicts a prior art DLNA to highlight that parallel drain inductors  $L_{d1}$  202 and  $L_{d2}$

204 may need to be separated by a distance to minimize interference. (*Id.*, 1:60-2:3.)

Series source inductors  $L_{s1}$  207a and  $L_{s2}$  207b share a common node and are therefore required to be kept close to the differential FET 209a and 209b. (*Id.*) The nearby inductors create mutual inductance which causes interference in the other inductor.



(*Id.*, Figure 2.)

41. As a solution, the '330 Patent discloses “[m]ultiple inductor structures and methods for providing low mutual inductance between inductors” where “the polarities of the inductors are positioned such that parasitic mutual inductance is reduced by causing electro-magnetic fields to at least partially cancel resulting in a reduction in interference between the inductors.” (*Id.*, 2:16-22.)

42. The '330 Patent discloses a spiral inductor design in Figure 4 below where a second inductor  $L_2$  404 is counter wound with respect to a first inductor  $L_1$

402. (*Id.*, 4:34-38.) The inductors 402 and 404 share a common node A 413 with current flowing in each inductor. (*Id.*, 4:38-40.) The current flows in a first direction from node A 413 to node B<sub>1</sub> 422 creating a magnetic field oriented out of the paper. (*Id.*, 4:40-47.) The current flows in a second direction from node A 413 to node B<sub>2</sub> 424 creating a magnetic field oriented into the plane of the paper. (*Id.*, 4:41-49.) The interference of opposing magnetic fields results in a cancellation effect at the points of interference which reduces mutual inductance and allows for closer placement of inductors within a circuit. (*Id.*, 4:49-54.)

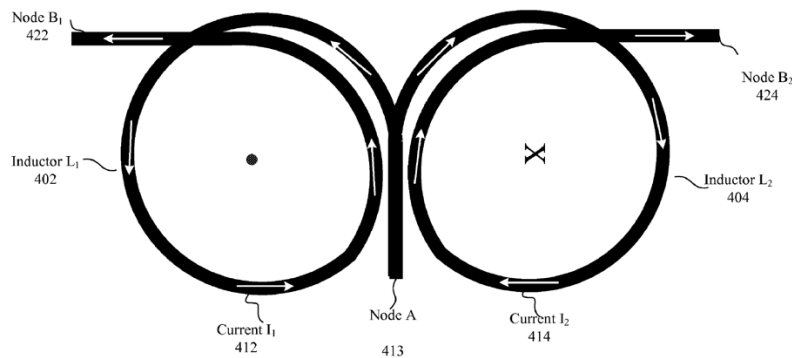


Figure 4

(*Id.*, Figure 4.)

43. The '330 Patent further discloses an octagonal spiral inductor structure in Figure 5 below which is like the embodiment of Figure 4 except for the shape of the inductors. (*Id.*, 5:18-24.) The '330 Patent further discloses that the octagonal spiral structure may reduce the complexity of manufacturing. (*Id.*)

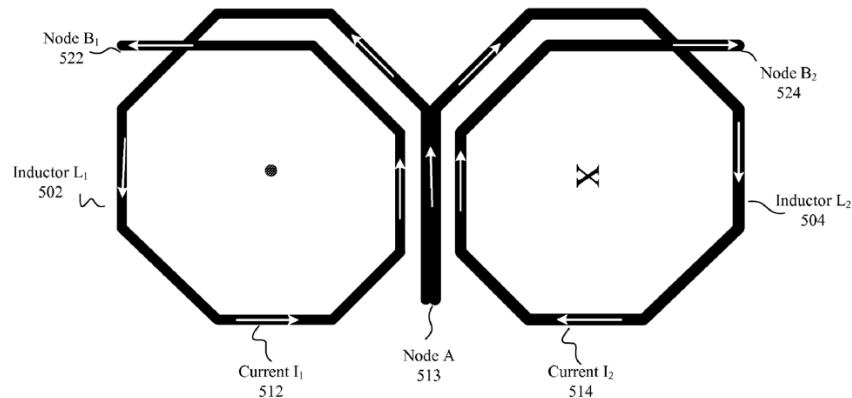


Figure 5

(*Id.*, Figure 5.)

44. The '330 Patent further discloses that the embodiments disclosed in Figures 4-5 could be implemented in circuits such as a DLNA such that inductors could be placed closer together and the size of buffers between inductors could be reduced. (*Id.*, 5:33-36.)

## VIII. CLAIM CONSTRUCTION

45. I understand that claim terms are typically given their ordinary and customary meaning, as would have been understood by a POSITA at the time of the alleged invention, which I understand is the early 2000s (including September 22, 2006). In considering the meaning of the claims, I also understand that one must consider the language of the claims, the specification, the prosecution history of record, and the knowledge of a POSITA at the relevant time.

## IX. OVERVIEW OF THE PRIOR ART

### A. Marques

46. Marques is entitled “Apparatus and Method for Reducing Interference” (Ex. 1005, Title.) and discloses an inductor configuration where current flows through the inductors in different directions to partially cancel magnetic field and reduce or minimize interference (*id.*, Abstract).

47. As shown in Figure 5 below, Marques discloses first and second inductors 10G and 10H coupled in series between terminals 12 and 14. (*Id.*, 5:11-20.) Because the current  $I$  flows in opposite directions through the inductors, the magnetic fields generated by inductors will at least partially cancel. (*Id.*, 5:20-25.)

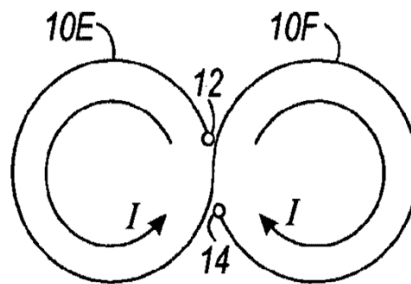


**FIG. 5**

(*Id.*, FIG. 5.)

48. Marques further discloses, as shown in Figure 7 below, first and second inductors 16 and 18 coupled in parallel between terminals 20 and 22. (*Id.*, 5:46-47.) Because the magnetic field induced by the current  $I_1$  flowing through inductor 16 is

in an opposite direction to the magnetic field induced by the current  $I_2$  flowing through inductor 18, the total magnetic field from inductors 16 and 18 will at least partially cancel. (*Id.*, 6:3-11.) The equivalent circuit diagram for the configuration of Figure 7 is shown in Figure 8 below. (*Id.*, 5:53-56.)

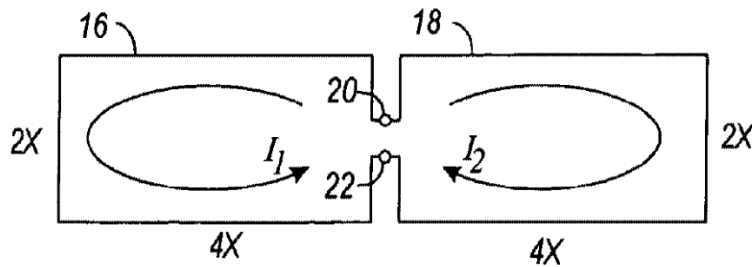


**FIG. 7**

(*Id.*, FIG. 7.)

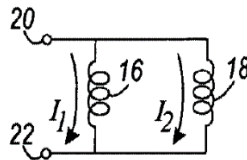


**FIG. 8**

(*Id.*, FIG. 8.)

49. Marques further discloses that the techniques of the invention reduce the interference problems in any desired application but specifically in the context of a radio frequency (RF) apparatus integrated on an integrated circuit (IC). (*Id.*, 10:46-58.)

**B. Lee**

50. Lee is entitled “The Design of CMOS Radio-Frequency Integrated Circuits.” (Ex. 1007, Title.) As provided in Figure 12.10 below, Lee discloses a common design example of a differential low noise amplifier (DLNA). (*Id.*, 388<sup>4</sup>.) Lee discusses that the design of amplifiers at high frequencies involves more detailed considerations than at lower frequencies. (*Id.*, 270.) For example, the effect of ever-present parasitic capacitances and inductances can impose serious constraints on performance. (*Id.*)

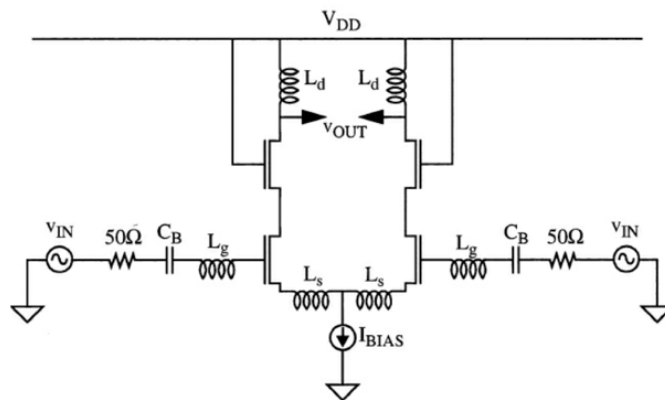


**FIGURE 12.10.** Differential LNA (simplified).

(*Id.*, FIGURE 12.10.)

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<sup>4</sup> Citations are to page numbers of THOMAS A. LEE, THE DESIGN OF CMOS RADIO-FREQUENCY INTEGRATED CIRCUITS (2d ed. 2004) (“Lee”) that are on the top of each page.

51. Lee further discloses that the most widely used on-chip inductor is the planar spiral which can assume many shapes as illustrated in Figure 4.21 below. (*Id.*, 137.)

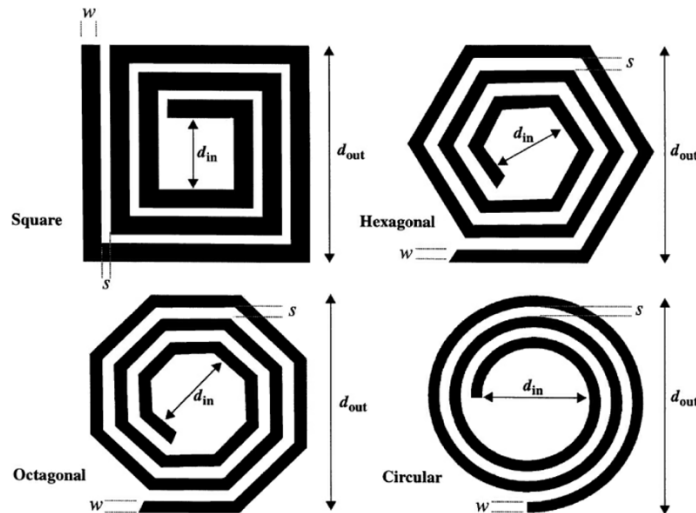


FIGURE 4.21. Planar spiral inductors.

(*Id.*, FIGURE 4.21.)

### C. Menegoli

52. Menegoli is entitled “Air Core Inductive Element on Printed Circuit Board for Use in Switching Power Conversion Circuitries.” (Ex. 1008, Title.) Menegoli discloses an inductor design that minimizes electromagnetic interference. (*Id.*, Abstract.) As shown in Figure 2A below, current is flowing in inductors La and Lb in opposite directions (clockwise in inductor La and counterclockwise in inductor Lb). (*Id.*, 8:13-23.)

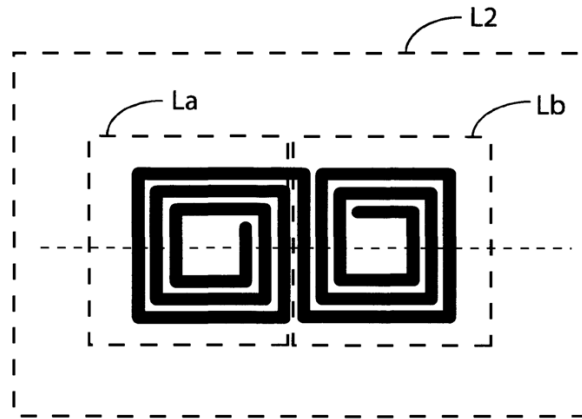


FIG.2A

(*Id.*, FIG. 2A.)

53. Menegoli discloses that alternate magnetic fields generated by oppositely the inductors improves the confining of “undesirable stray magnetic field within the area of the inductors to eliminates electromagnetic interference and reduce even further the losses due to the radiated power.” (*Id.*, 9:47-52.)

## **X. THE PRIOR ART DISCLOSES ALL OF THE FEATURES OF THE CHALLENGED CLAIMS**

### **A. Marques Discloses the Features of Claims 1, 2, 4-10, 17, 18, and 20**

54. In my opinion, Marques discloses all of the features of claims 1, 2, 4-10, 17, 18, and 20.

**1. Claim 1**

**(a) “A multiple inductor array comprising:”**

55. I understand “[a] multiple inductor array comprising” is the preamble to claim 1 of the ’330 Patent. I have been asked to assume that the preamble is a claim limitation. Under that assumption, in my opinion, Marques discloses this claim feature. Marques discloses a structure that includes two or more inductors. (Ex. 1005, Abstract, 3:25-27 (“a magnetically differential inductive structure may take the form of two or more inductors”), 4:54-55 (“any desired number of loops can be used”), 4:57-58 (“In the examples illustrated in FIG. 2 and FIG. 4A, two loops are shown.”) 4:59-61 (“Instead of two series loops, the examples shown in FIG. 4B includes four series loops.”).)

**(b) “a first node that receives a first current and a second current;”**

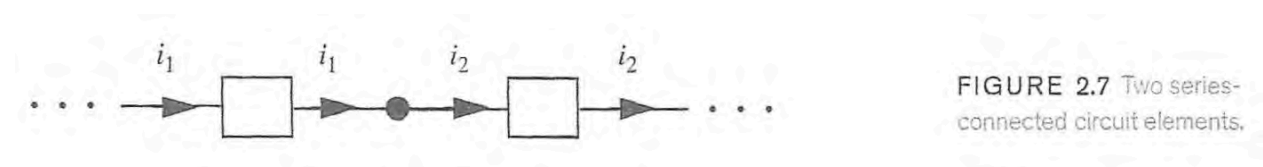
56. In my opinion, Marques discloses this claim feature. An electronic circuit is constructed by connecting a collection of separate elements at their terminals. (Ex. 1014, 54<sup>5</sup>.) The junction points at which terminals of two or more

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<sup>5</sup> Citations are to page numbers of ANANT AGARWAL AND JEFFERY H. LANG, FOUNDATIONS OF ANALOG AND DIGITAL ELECTRONIC CIRCUITS (2005) (“Agarwal”) that are on the top of each page.

elements are connected are referred to as the nodes of a circuit. (*Id.*) The connections between the nodes are referred to as the edges or branches of a circuit. (*Id.*) I have also reviewed the Special Master Report and Recommendation on Claim Construction and agree with the Special Master's tentative construction of the term "node" as "a point of connection or intersection in an electrical circuit." (Ex. 1015, 27.<sup>6</sup>)

57. Figure 2.7 below shows an example of two series connected circuit elements. (Ex. 1014, 57.) The series connection is defined by two branches joined by a common node. (*Id.*, 56-57.)



(*Id.*, Figure 2.7.)

58. Likewise, Marques discloses in annotated Figure 5 below, a common node ("first node") between series coupled circuit elements: inductors 10E and 10F.

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<sup>6</sup> Citations are to page numbers of Special Master Report and Recommendation on Claim Construction, *Bell Semiconductor, LLC vs. NXP USA, INC., et al.* 8:22-cv-02133-HDV-ADS (C.D. California) (October 16, 2023) ("Special Master Report") that are on the bottom of each page.

(Ex. 1005, 5:11-12.) Due to the oppositely wound inductors, the current in inductor 10E is going one direction (current  $I_1$ ) and the current in inductor 10F is going the opposite direction (current  $I_2$ ). (*Id.*, 5:21-25.) The common node can be viewed as the intersection of where  $I_1$  and  $I_2$  meet (i.e., the first node receives a first and second current).

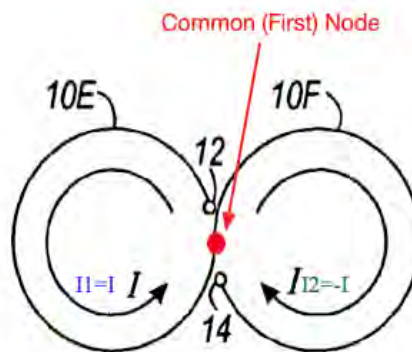


**FIG. 5**

(*Id.*, FIG. 5 (annotated).)

59. Marques further discloses a parallel connected inductor structure in Figure 7 below. (*Id.*, 5:49-53.) Either the node 20 or node 22 is the common node where currents  $I_1$  and  $I_2$  flow from the common node. As shown more clearly in the equivalent circuit diagram for the inductor structure of Figure 7 (annotated Figure 8 below) a “first node” 20 is receiving a first current  $I_1$  and a second current  $I_2$ . (*Id.*)

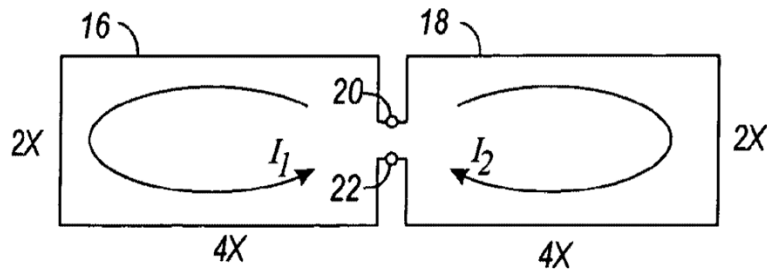


**FIG. 7**

(*Id.*, FIG. 7.)

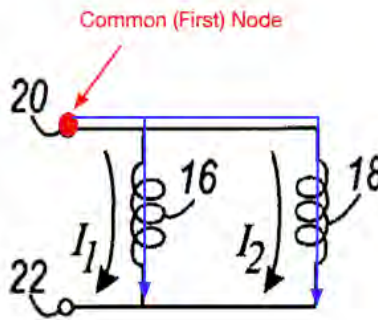


**FIG. 8**

(*Id.*, FIG. 8 (annotated).)

60. Therefore, whether considering Marques' series connected inductor structure or the parallel connected inductor structure, Marques discloses a first node receiving a first and second current.

- (c) **“a first inductor coil, coupled to the first node and to a second node, that communicates the first current in a clockwise direction and generates a first magnetic field;”**

61. In my opinion, Marques discloses this claim feature. Because the current in inductor 10F of annotated Figure 5 below is flowing in a clockwise direction, I will refer to inductor 10F as the first inductor and the current flowing in inductor 10F as the first current  $I_{II}$  when discussing Marques Figure 5. As shown in annotated Figure 5 below, the first inductor 10F is coupled to a first node (e.g., as discussed above, there is a common node between the first and second inductors) and a second node (i.e., terminal 14, highlighted in green). (*Id.*, 5:11-14.)

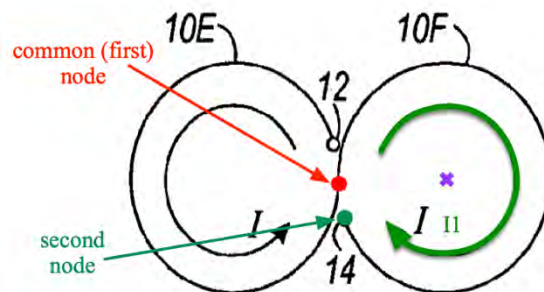
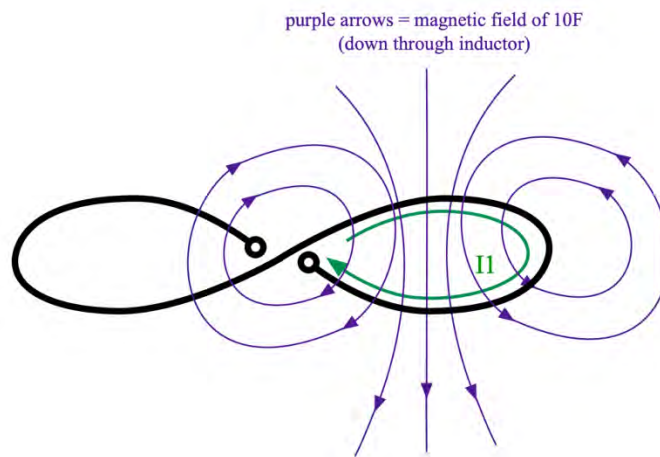


**FIG. 5**

(*Id.*, FIG. 5 (annotated).)

62. Marques further discloses in annotated Figure 5 above, that the magnetic field induced by the current flowing through the first inductor in a

clockwise direction will generate a magnetic field directed into the plane of the paper as indicated by the purple “x” in the center of first inductor 10F (in accordance with the right-hand rule). (*Id.*, 4:20-22, 5:21-25, 5:25-29.) Below is a redrawn, annotated version of Marques’ Figure 5. Redrawn, annotated Figure 5 below shows the inductor structure at an angle to illustrate the magnetic field lines of the first inductor flowing downwards through the first inductor when current  $I_1$  is flowing in a clockwise direction.



(*Id.*, FIG. 5 (redrawn, annotated).)

- (d) “a second inductor coil, coupled to the first node and to a third node, that communicates the second current in a counter clockwise direction and generates a second magnetic field having an opposing orientation to the first magnetic field; and”

63. In my opinion, Marques discloses this claim feature. Because the current in inductor 10E of annotated Figure 5 below is flowing in a counterclockwise direction, I will refer to inductor 10E as the second inductor and the current flowing in inductor 10E as the second current I<sub>2</sub> when discussing Marques Figure 5. As shown in annotated Figure 5 below, the second inductor 10E is coupled to a first node (e.g., as discussed above, there is a common node between the first and second inductors) and a third node (i.e., terminal 14, highlighted in blue). (*Id.*, 5:11-14.)

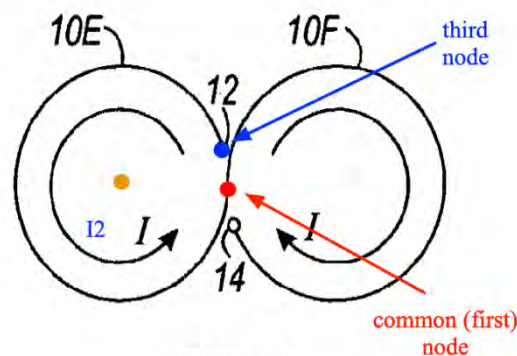
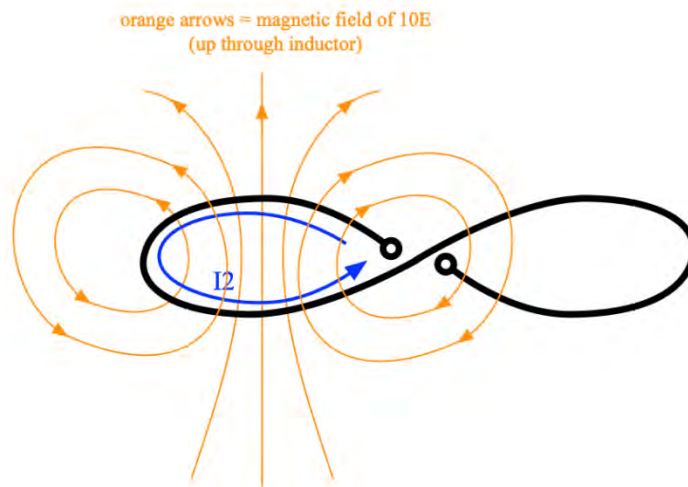


**FIG. 5**

(*Id.*, FIG. 5 (annotated).)

64. Marques further discloses in annotated Figure 5 above, that the magnetic field induced by the current flowing through the second inductor in a counterclockwise direction will generate a magnetic field directed out of the plane of the paper as indicated by the orange dot in the center of second inductor 10E (in accordance with the right-hand rule) which is the opposite orientation of the magnetic field generated by the current in the first inductor (as indicated by the purple “x” in previous Figures above). (*Id.*, 4:20-22, 5:21-25, 5:25-29.).

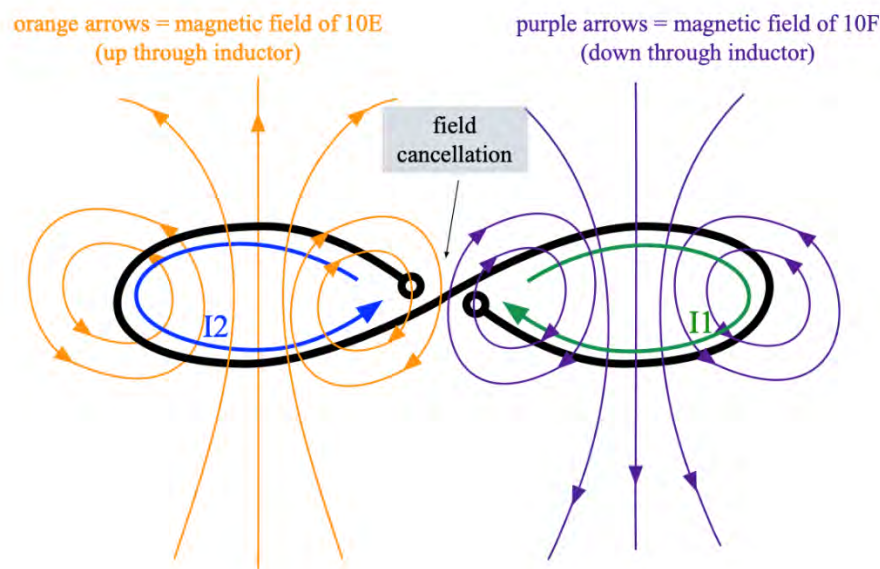
65. Below is a redrawn, annotated version of Marques’ Figure 5. Redrawn, annotated Figure 5 below shows the inductor structure at an angle to illustrate the magnetic field lines of the second inductor flowing upwards through the second inductor when current  $I_2$  is flowing in a counterclockwise direction.



(*Id.*, FIG. 5 (redrawn, annotated).)

(e) “wherein the first magnetic field and the second magnetic field at least partially cancel at an interference point.”

66. In my opinion, Marques discloses this claim feature. Marques discloses that since the magnetic field induced by the current flowing through the first inductor will be opposite to the magnetic field induced by the current flowing through the second inductor, the total magnetic field will at least partially cancel out. (*Id.*, 4:20-24.) As illustrated in redrawn, annotated Figure 5 below, at least a portion of the opposing magnetic fields in inductors 10E and 10F will at least partially cancel at an interference point based on the interference of the oppositely oriented magnetic fields.



(*Id.*, FIG. 5 (redrawn, annotated).)

67. Marques further discloses in Figure 12 below that magnetic field cancellation is optimal at axis 38 where the distance to each inductor 50 and 52 is equal. (*Id.*, 9:11-14.) As such, Marques discloses a first and second magnetic field that cancel at an interference point (e.g., as illustrated by optimal magnetic field cancellation axis 38).

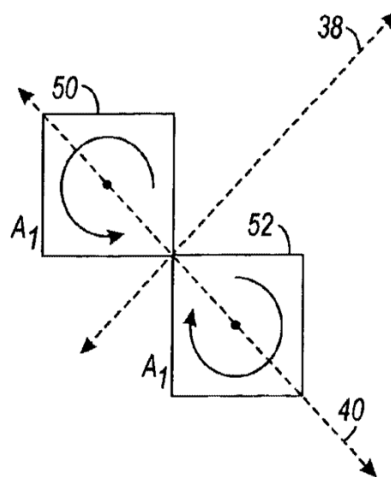


**FIG. 12**

(*Id.*, FIG. 12.)

**2. Claim 2**

**(a) “The array of claim 1 wherein the first inductor coil and the second inductor coil are spiral structures.”**

68. In my opinion, Marques discloses this claim feature. Marques discloses in Figure 5 below first and second inductors having a round shape. (*Id.*, 5:14-15.)

A round shape is a spiral structure. Therefore, Marques discloses that first and second inductor coils are spiral structures.

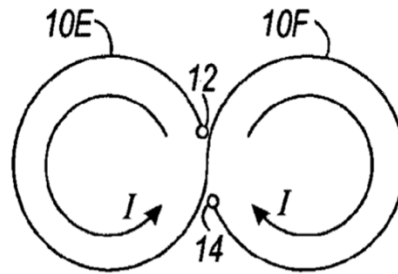


**FIG. 5**

(*Id.*, FIG. 5.)

**3. Claim 4**

- (a) “The array of claim 1 wherein a change in magnitude of the first magnetic field causes a change in magnitude of the second magnetic field.”**

69. In my opinion, Marques inherently discloses this claim feature. As discussed in the technical background section of this Declaration, when a current flows through an inductor, a magnetic field proportional to the current is produced. Therefore, because current *I* flows through inductors 10E and 10F (as shown in Figure 5 above), a change in current *I* would change the magnetic fields produced by both inductors. To cause a change in the first magnetic field, a change in current

I would need to occur which would cause a change in the second magnetic field as well.

**4. Claim 5**

- (a) “The array of claim 1 wherein a change in magnitude of the second magnetic field causes a change in magnitude of the first magnetic field.”**

70. In my opinion, Marques inherently discloses this claim feature. As discussed above, when a current flows through an inductor, a magnetic field proportional to the current is produced. Therefore, because current I flows through inductors 10E and 10F (as shown in Figure 5 above), a change in current I would change the magnetic fields produced by both inductors. To cause a change in the second magnetic field, a change in current I would need to occur which would cause a change in the first magnetic field as well.

**5. Claim 6**

- (a) “The array of claim 1 wherein the first and second currents flow within the same direction.”**

71. In my opinion, Marques discloses this claim feature. In Marques, as in the '330 Patent, the inductor configuration dictates the way that current flows within

the structure. (*Id.*, 5:21-25.) For example, Marques discloses an equivalent circuit diagram of a parallel inductor structure as shown in Figure 8 below. (*Id.*, 5:41-56.)

72. Marques further discloses the equivalent circuit diagram of Figure 7 in Figure 8 below. (*Id.*, 5:53-56.) The currents  $I_1$  and  $I_2$  are shown to flow in the same direction through inductors 16 and 18. (*Id.*) Therefore, Marques discloses first and second currents flowing in the same direction.

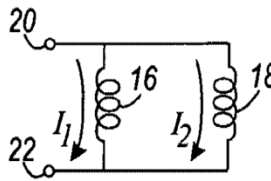


**FIG. 8**

(*Id.*, FIG. 8.)

**6. Claim 7**

**(a) “The array of claim 1 wherein the first and second currents flow in opposing directions.”**

73. In my opinion Marques discloses this claim feature. As discussed above, in Marques, as in the '330 Patent, the inductor configuration dictates the way that current flows within the structure. (*Id.*, 5:21-25.) The inductors in the Marques structure are configured “such that current flows in opposite directions through the loops.” (*Id.*, 1:52-54.) Therefore, regardless of the direction of current is flowing

upon entering the inductor structure, the configuration of the inductors results in first and second currents flowing in opposing directions.

**7. Claim 8**

- (a) “The array of claim 1 wherein the magnitudes of the first and second currents are related so that a change in the first current causes a corresponding change in the second current in order to cause a reactionary interference cancellation.”**

74. In my opinion Marques inherently discloses this claim feature. As discussed above, when a current flows through an inductor, a magnetic field proportional to the current is produced. Because current I flows through inductors 10E and 10F (as currents I1 and I2 in annotated Figure 5 above), a change in current I would change both the first and second currents through the inductors. Therefore, to change the current through one inductor, a change in current I needs to occur which ultimately changes the current in the other inductor and produces opposing magnetic fields proportional to the new current (i.e., reactionary interference cancellation).

**8. Claim 9**

- (a) “The array of claim 1 further comprising a third inductor coil that generates a third magnetic field that cancels at least a portion of the first magnetic field.”**

75. In my opinion, Marques discloses this claim feature. Marques discloses in Figure 4B below, an inductor structure consisting of four inductors 10C, 10D, 10E, and 10F coupled in series between terminals 12 and 14. (*Id.*, 4:61-62.) The current through inductors 10C and 10F is flowing in the same direction and current flowing through inductors 10D and 10E are flowing in the opposite direction. (*Id.*, 5:2-5.) Therefore, the magnetic fields generated by inductors 10C, 10D, 10E, and 10F are at least partially cancelled. (*Id.*, 5:5-8.) As such, if inductors 10C and 10D are viewed as the first and second inductors, a third inductor 10E could be viewed as partially cancelling the magnetic field produced by the first inductor 10C.

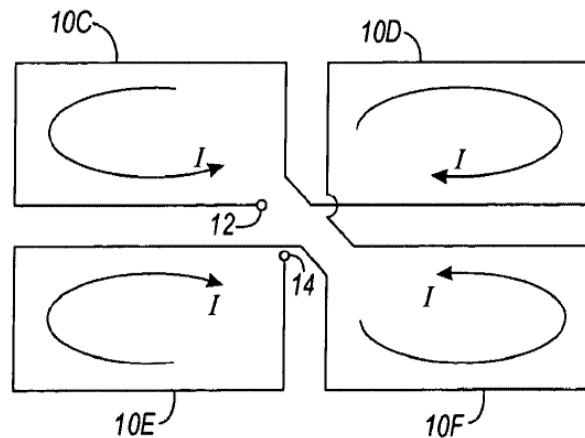


**FIG. 4B**

(*Id.*, FIG. 4B.)

**9. Claim 10**

**(a) “The array of claim 1 further comprising a third inductor coil that generates a third magnetic field that cancels at least a portion of the second magnetic field.”**

76. In my opinion, Marques discloses this claim feature. Marques discloses in Figure 4B above, an inductor structure consisting of four inductors 10C, 10D, 10E, and 10F coupled in series between terminals 12 and 14. (*Id.*, 4:61-62.) The current through inductors 10C and 10F is flowing in the same direction and current flowing through inductors 10D and 10E are flowing in the opposite direction. (*Id.*, 5:2-5.) Therefore, the magnetic fields generated by inductors 10C, 10D, 10E, and 10F are at least partially cancelled. (*Id.*, 5:5-8.) As such, if inductors 10C and 10D are viewed as the first and second inductors, a third inductor 10F could be viewed

as generating a third magnetic field that partially cancels the magnetic field produced by the second inductor 10D.

**10. Claim 17**

**(a) “A method for reducing the amount of parasitic mutual inductance between inductors, the method comprising:”**

77. Under that assumption that the preamble is a claim limitation, in my opinion, Marques discloses this claim feature. Marques discloses that blocks of circuitry may interfere with other blocks such as in the case of interference caused by parasitic loops (*Id.*, 2:59-67.) Marques further discloses that for proper circuit function, interference needs to be reduced or minimized to a desirable level. (*Id.*, 2:67-3:2, 3:20-24 (“The present invention addresses the problem of interference by designing inductive structures in such a way that magnetic fields generated by the structures is a least partially cancelled.”).) Interference caused by parasitic loops is viewed at the equivalent of parasitic mutual inductance in this context. Therefore, Marques discloses a method for reducing the amount of parasitic mutual inductance between inductors.

**(b) “generating a first magnetic field, from a first inductor coil communicating a first current in a first direction;”**

78. In my opinion, Marques discloses this claim feature. As discussed above regarding claim 1, Marques discloses in annotated Figure 5 below, first and second inductors coupled in series between terminals 12 and 14. (*Id.*, 5:12-14.)

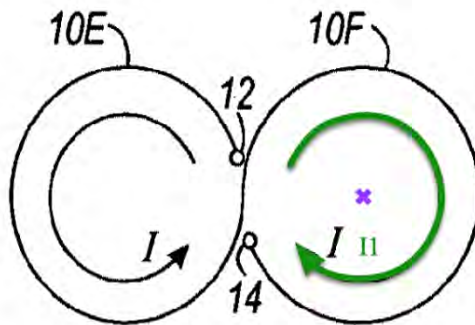


**FIG. 5**

(*Id.*, FIG. 5 (annotated).)

79. Marques further discloses that the magnetic field induced by the current flowing through the first inductor in a clockwise direction will be opposite to the magnetic field induced by the current flowing in a counterclockwise direction through the second inductor (the purple “x” in annotated Figure 5 above depicts the first magnetic field going into the page). (*Id.*, 4:20-22, 5:21-25, 5:25-29.) As such, Marques discloses generating a first magnetic field from a first inductor coil communicating a first current in a first direction.

- (c) “generating a second magnetic field, from a second inductor coil communicating a second current in a second direction that is opposite to the first direction, the second magnetic field having an opposing orientation to the first magnetic field; and;”

80. In my opinion, Marques discloses this claim feature. Marques discloses in annotated Figure 5 below, first and second inductors coupled in series between terminals 12 and 14. (*Id.*, 5:12-14.)

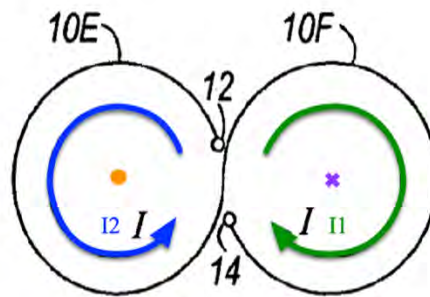


**FIG. 5**

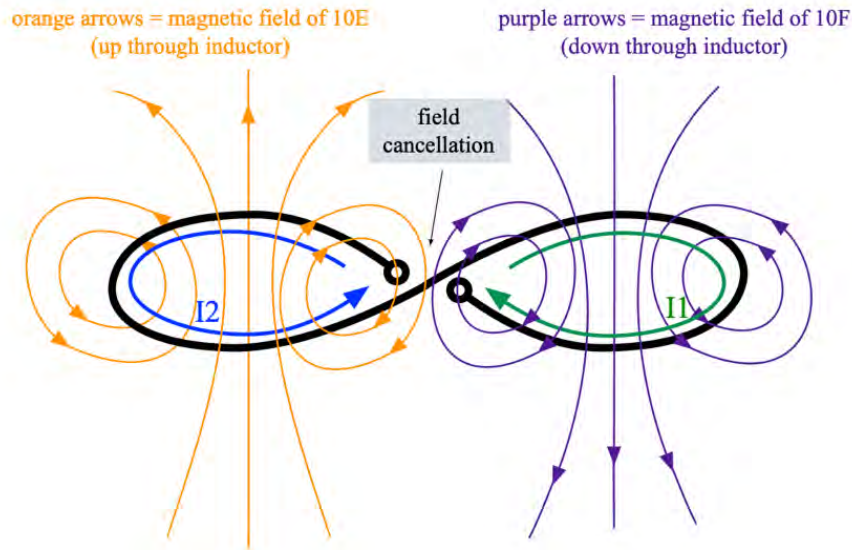
(*Id.*, FIG. 5 (annotated).)

81. Marques further discloses that the magnetic field induced by the current flowing through the first inductor in a clockwise direction will be opposite to the magnetic field induced by the current flowing in a counterclockwise direction through the second inductor (as indicated in annotated Figure 5 above by the purple “x” depicting the first magnetic field going into the page in the first inductor and the

orange dot depicting the second magnetic field going out of the page in the second inductor). (*Id.*, 4:20-22, 5:21-25, 5:25-29.) As such, Marques discloses generating a second magnetic field from a second inductor coil communicating a second current in a second direction that is opposite to the first direction where the second magnetic field has an opposing orientation to the first magnetic field.

**(d) “canceling at least a portion of the first and second magnetic fields by magnetic cancellation resulting from the opposing orientations of the first and second magnetic fields.”**

82. In my opinion, Marques discloses this claim feature. Marques discloses in redrawn, annotated Figure 5 below that since the magnetic field induced by the current flowing through the first inductor will be opposite to the magnetic field induced by the current flowing through the second inductor, the total magnetic field will at least partially cancel out. (*Id.*, 4:20-24.)



(*Id.*, FIG. 5 (redrawn, annotated).)

**11. Claim 18**

- (a) “The method of claim 17 wherein the magnitude of the first and second magnetic fields are related such that a change in the first magnetic field result in a change in the second magnetic field.”**

83. In my opinion, Marques inherently discloses this claim feature. As discussed above, when a current flows through an inductor, a magnetic field proportional to the current is produced. Therefore, because current  $I$  flows through inductors 10E and 10F (as shown in annotated Figure 5 above), a change in current  $I$  would change the magnetic fields produced by both inductors. To cause a change

in the second magnetic field, a change in current  $I$  would need to occur which would cause a change in the first magnetic field as well.

**12. Claim 20**

- (a) **“The method of claim 17 wherein the first and second magnetic coils are structured in a spiral configuration.”**

84. In my opinion, Marques discloses this claim feature. Marques discloses in Figure 5 below, first and second inductors having a round shape. (*Id.*, 5:14-15.) A round shape is a spiral structure. Therefore, Marques discloses that the first and second magnetic coils are structured in a spiral configuration.

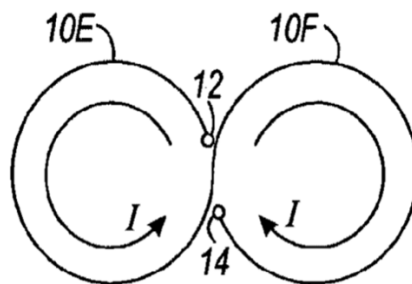


**FIG. 5**

(*Id.*, FIG. 5.)

**B. Marques Discloses or Suggests the Features of Claims 3 and 19**

85. In my opinion, Marques discloses or suggests the features of claims 3 and 19. While the limitations of claims 3 and 19 are not explicitly disclosed by

Marques, the differences between claims 3 and 19 and Marques are such that the claimed invention as a whole would have been obvious before the time of the alleged invention to a POSITA.

86. Marques is analogous art to the '330 Patent because Marques and the '330 Patent are in the same field of endeavor. Marques discloses an inductor structure to be used in various circuitry to reduce interference caused by parasitic inductance (Ex. 1005, 2:61-3:4, 3:20-34.) Similarly, the '330 Patent discloses an inductor design to be used in numerous different circuits to reduce parasitic mutual inductance. (Ex. 1001, 2:26-30.)

87. A POSITA would have been motivated to modify the shape of the inductor structure of Marques based on what was generally known in the art at the time of the alleged invention and would have done so with a reasonable expectation of success. Planar spiral inductor shapes were well known in the art and usually selected based on personal preference or design tools. (Ex. 1007, 136.) A shape modification may result in a slight performance improvement and therefore adjusting the shape to improve performance or enhance convenience would result in a reasonable expectation of success. (*Id.*)

**1. Claim 3**

- (a) “The array of claim 1 wherein the first inductor coil and the second inductor coil are octagonal structures.”**

88. In my opinion, Marques discloses or suggests this claim feature. Inductor coils having octagonal structures were widely known to a POSITA at the time of the alleged invention. The most widely used on-chip inductor around the time of the alleged invention was the planar spiral. (Ex. 1007, 136.) Octagonal and circular spirals were favored planar spiral shapes with slightly better performance than other shapes. (*Id.*)

89. Marques discloses in Figure 6 below, a first and second inductor having a hexagonal shape. (Ex. 1005, 5:29-30.)

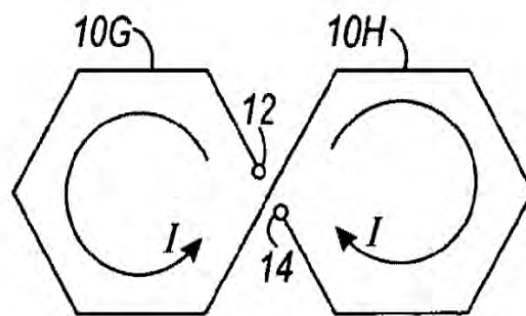


**FIG. 6**

(*Id.*, FIG. 6.)

90. A POSITA would have found it obvious to adjust the hexagonal spiral shape of Marques to another highly common planar spiral structure (an octagonal spiral shape) to improve performance or to make use of available layout tools. (Ex. 1007, 136.)

**2. Claim 19**

**(a) “The method of claim 17 wherein the first and second magnetic coils are structured in an octagonal configuration.”**

91. In my opinion, Marques discloses or suggests this claim feature. Marques discloses in Figure 6 above, a first and second inductor having a hexagonal shape. (Ex. 1005, 5:29-30.) As discussed above, a POSITA would find it obvious to adjust the hexagonal spiral shape of Marques to another highly common planar spiral structure (an octagonal spiral shape) to improve performance or to make use of available layout tools. (Ex. 1007, 136.)

**C. Marques in Combination with Lee Discloses or Suggests the Features of Claims 3, 11-16, and 19**

92. In my opinion, Marques in combination with Lee discloses or suggests all of the features of claims 3, 11-16, and 19. As discussed above, Marques is analogous art to the '330 Patent because Marques and the '330 Patent are in the same

field of endeavor. Marques discloses an inductor structure to be used in various circuitry to reduce interference caused by parasitic inductance (Ex. 1005, 2:61-3:4, 3:20-34.) Similarly, the '330 Patent discloses an inductor design to be used in numerous different circuits to reduce parasitic mutual inductance. (Ex. 1001, 2:26-30.)

93. Lee is also analogous art to the '330 Patent because Lee and the '330 Patent are in the same field of endeavor. Lee provides discussion and schematics for common IC components and circuitry such as differential low noise amplifiers (DLNAs) at the time of the alleged invention. (Ex. 1007, 136-137, 388.) Lee discusses that high frequency amplifiers face serious constraints due to “ever-present parasitic capacitances and inductances.” (*Id.*, 270.) Similarly, the '330 Patent discloses that the impact of cross-coupling or crosstalk is a more significant issue in circuits operating at high frequencies. (Ex. 1001, 1:16-21.) The counter wound inductor structure of the '330 Patent may be used in a DLNA to minimize crosstalk and maintain the reliability of the circuit. (*Id.*, 2:42-50.)

94. A POSITA would have been motivated to modify Marques in view of Lee and would have done so with a reasonable expectation of success. As I explained above, Marques discloses an inductor structure where oppositely wound inductors cause magnetic field cancellation which reduces parasitic mutual

inductance between the inductors. (Ex. 1005, 1:36-45.) The technical problem addressed by Marques is interference between components in an IC. (*Id.*, 1:29-33.) This technical problem is specifically mentioned in Lee as an issue regarding high frequency amplifiers (i.e., “ever-present” parasitic inductance). (Ex. 1007, 270.)

95. Because DLNAs include closely positioned inductors and interference between inductors is discussed as a known issue in Marques and Lee, a POSITA at the time of the alleged invention would have been motivated to combine the inductor structure of Marques into the DLNA structure disclosed by Lee in order to reduce parasitic interference between inductors. (Ex. 1007, 388, 270; Ex. 1005, 2:38-3:4). Accordingly, the modification of Marques would simply involve implementing the inductor structure of Marques in a known DLNA circuit as provided by Lee to solve a known problem of parasitic inductance. Further modifications of Marques in view of Lee would involve adjusting the inductor structure of Marques to other widely known and common shapes.

96. A POSITA would have a reasonable expectation of success in applying Marques’ teachings to the circuitry components of Lee given that the DLNA of Lee includes closely positioned inductors and the purpose of Marques is to reduce interference between closely positioned inductors and parasitic inductance is a concern of Lee. Further, adjusting the shape of the inductors to other well-known

planar spiral shapes would be successful because the adjustment can improve performance or convenience.

**1. Claim 3**

**(a) “The array of claim 1 wherein the first inductor coil and the second inductor coil are octagonal structures.”**

97. While Marques in combination with what was known by a POSITA at the time of the alleged invention renders claim 3 obvious as discussed above, in my opinion, Marques in combination with Lee also discloses or suggests this claim feature. Marques discloses in Figure 6 below, a first and second inductor having a hexagonal shape. (*Id.*, 5:29-30.)

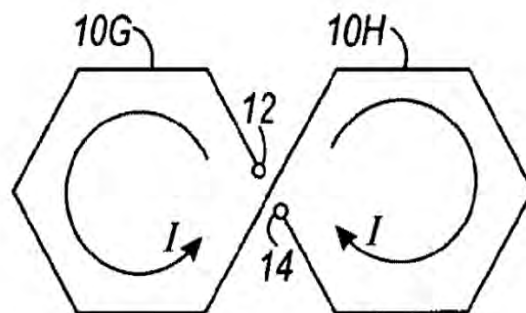


**FIG. 6**

(*Id.*, FIG. 6.)

98. While Marques does not explicitly disclose inductors having an octagonal structure, Lee discloses that “the most widely used on-chip inductor is the

planar spiral, which can assume many shapes.” (Ex. 1007, 136.) Common inductor spiral shapes are shown in Lee’s Figure 4.21 below which includes an octagonal shape. (*Id.*, 137.) Lee further discloses that the choice of shape is more often made on the basis of convenience or habit than anything else. (*Id.*, 136.) Octagonal and circular spirals were favored planar spiral shapes with slightly better performance than other shapes. (*Id.*)

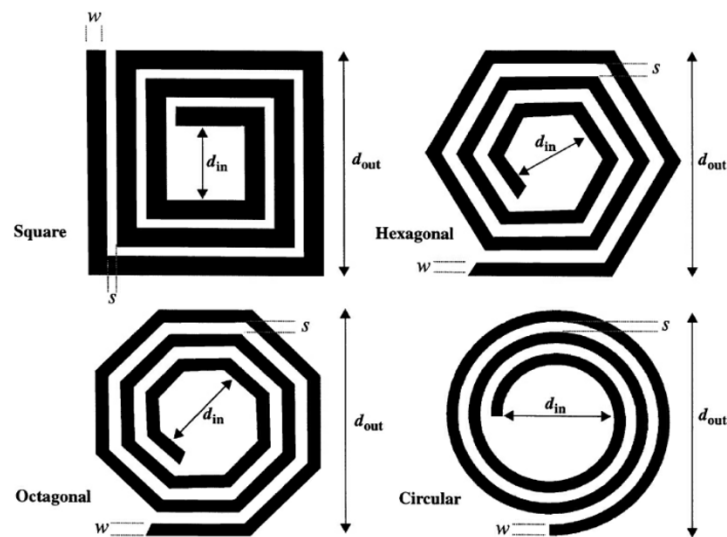


FIGURE 4.21. Planar spiral inductors.

(*Id.*, FIGURE 4.21.)

99. In my opinion, in view of Lee, octagonal inductor structures were well known to a POSITA and were widely used in RF apparatuses. Marques and Lee are references in the same field and both disclose inductor structures in the context of RF apparatuses. Therefore, in my opinion, a POSITA could look to Lee to adjust

the hexagonal structure of Marques Figure 6 to an octagonal structure based on desired design features of the circuit or personal preference.

## 2. Claim 11

### (a) “A differential low noise amplifier comprising:”

100. Under the assumption that the preamble is a claim limitation, in my opinion, Marques in combination with Lee discloses or suggests this claim feature. While Marques discusses the use of inductors in various circuitry, Marques does not explicitly disclose using the inductor structure in a differential low noise amplifier. (Ex. 1005, 1:20-32.) However, Lee discloses in Figure 12.10 below, a differential low noise amplifier (DLNA) schematic. (Ex. 1007, 388.)

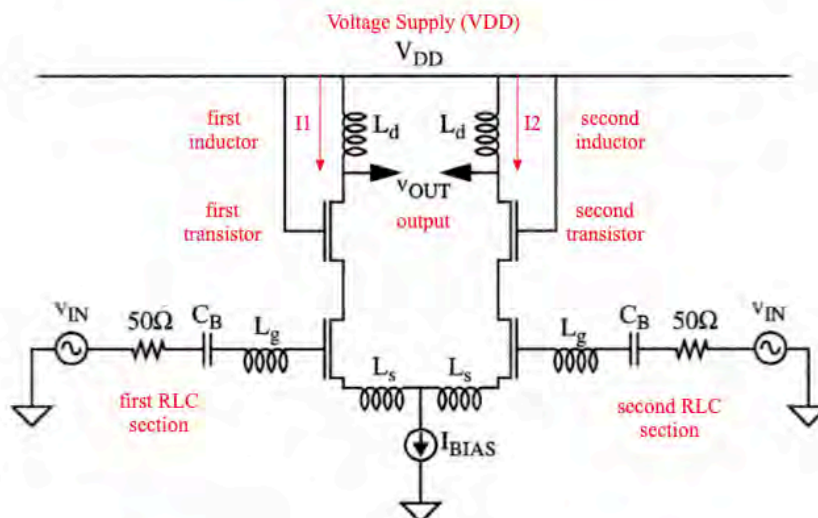


**FIGURE 12.10.** Differential LNA (simplified).

(*Id.*, FIGURE 12.10 (annotated).)

101. The '330 Patent discloses the above circuit diagram as Prior Art Figure 2 and discusses the motivation for using an inductor structure with magnetic field cancellation in a DLNA. (Ex. 1001, 1:60-65, 2:43-48 (“Because this invention minimizes the crosstalk between inductors placed in close proximity to each other, the overall chip geometry may be reduced and component density improved. In implementations such as a DLNA, the counter wound inductor design having a common node may be utilized.”).)

102. Similarly, Marques discloses an inductor structure design that addresses parasitic interference in any desired application by at least partially canceling magnetic fields. (Ex. 1005, 2:38-66, 3:20-23.) Because DNLAs include closely positioned inductors, a POSITA would have been motivated to combine the inductor structure of Marques into the known DLNA structure disclosed by Lee in order to reduce parasitic interference between inductors. (Ex. 1007, 388.)

**(b) “a voltage supply that generates a first current and a second current;”**

103. In my opinion, Marques in combination with Lee discloses or suggests this claim feature. Lee discloses in annotated Figure 12.10 above, a voltage source (VDD). (*Id.*) According to Ohm’s Law ( $v=iR$ ), current through a conductor between two points is directly proportional to the voltage across the two points. Thus, the

voltage source connected to two parallel inductors as shown above will provide a first current ( $I_1$ ) through the first inductor and a second current ( $I_2$ ) through the second inductor. Therefore, the voltage source of Lee supplies a first and second current.

**(c) “a first inductor coil, coupled to the voltage supply  
and to a first transistor, that communicates the first  
current in a first direction and generates a first  
magnetic field;”**

104. In my opinion, Marques in combination with Lee discloses or suggests this claim feature. Lee discloses in annotated Figure 12.10 above, a first inductor coil coupled to the voltage source (VDD) and to a first transistor. (*Id.*)

105. Marques discloses in annotated Figure 7 below, a first inductor 16 that communicates a first current  $I_1$  in a first direction (shown here as counterclockwise) that generates a magnetic field (shown as an orange dot indicating a magnetic field going out of the page). (Ex. 1005, 5:41-51.) A POSITA would have been motivated to combine the inductor structure of Marques into the known DLNA schematic of Lee in order to reduce parasitic interference due to the closely positioned inductors in Lee.

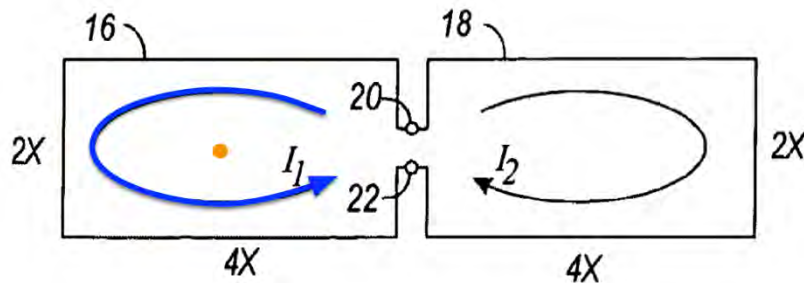


**FIG. 7**

(*Id.*, FIG. 7 (annotated).)

- (d) “a second inductor coil, coupled to the voltage supply, a second transistor, and in parallel with the first inductor coil, that communicates the second current in a second direction that is opposite to the first direction and generates a second magnetic field having an opposing orientation to the first magnetic field;”

106. In my opinion, Marques in combination with Lee discloses or suggests this claim feature. Lee discloses in annotated Figure 12.10 above, a second inductor coil coupled to the voltage source (VDD), a second transistor, and in parallel with the first inductor coil. (Ex. 1007, 388.)

107. Marques discloses in annotated Figure 7 below, a first inductor 16 in parallel with a second inductor 18 where the second inductor 18 communicates a second current  $I_2$  in a second direction (shown here as clockwise) that generates a

magnetic field (shown here as a purple “x” going into the plane of the paper whereas the magnetic field of the first inductor 16 is going out of the plane of the paper as shown by the orange dot). (Ex. 1005, 6:5-10.)

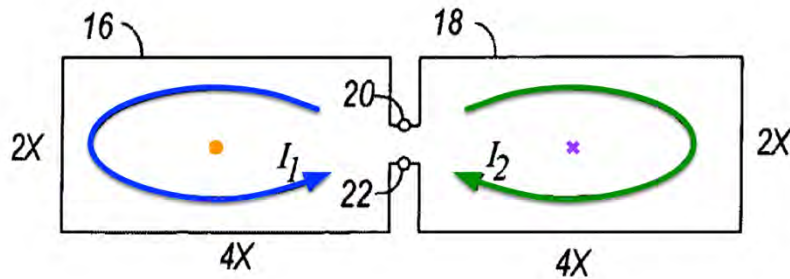
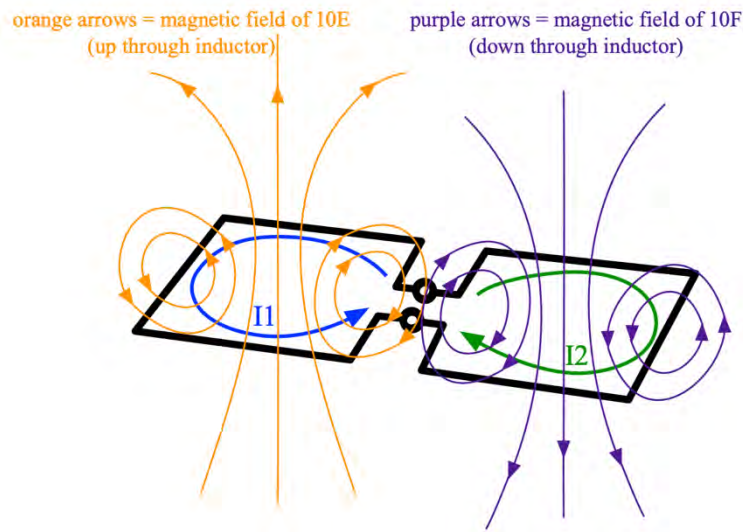


**FIG. 7**

(*Id.*, FIG. 7 (annotated).)

108. Figure 7 of Marques is redrawn and annotated below with the parallel inductor structure at an angle to show magnetic field lines. The second inductor 18 communicates a second current  $I_2$  in a second direction (i.e., clockwise) that generates a magnetic field (purple lines) going downward through the second inductor whereas the first current  $I_1$  is in a first direction (i.e., counterclockwise) through the first inductor 18 and generates a magnetic field (orange lines) going up out of the first inductor 16. (*Id.*) A POSITA would have been motivated to use the inductor structure of Marques in the DLNA of Lee in order to reduce interference between closely positioned inductors.



(*Id.*, FIG. 7 (redrawn, annotated).)

(e) “a first RLC section that is coupled to the first inductor coil;”

109. In my opinion, Marques in combination with Lee discloses or suggests this claim feature. Lee discloses in annotated Figure 12.10 below, a first RLC section coupled to the first inductor coil. (Ex. 1007, 388.) While the RLC section is not directly coupled to the first inductor coil, they are coupled via intermediary components.

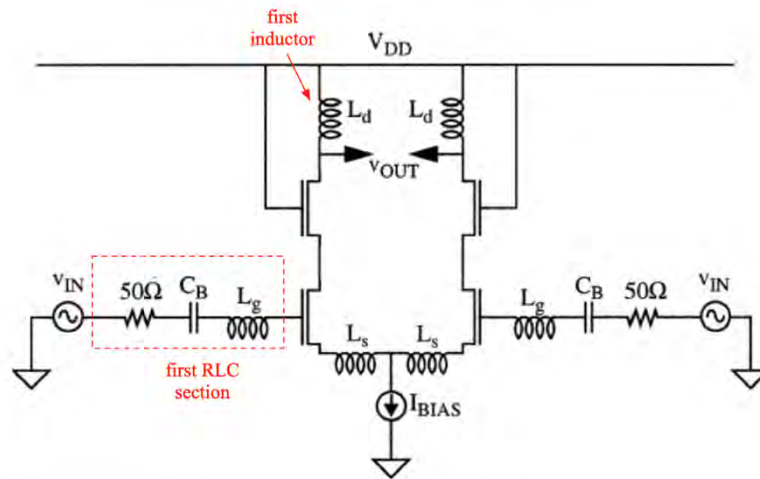


**FIGURE 12.10.** Differential LNA (simplified).

(*Id.*, Figure 12.10 (annotated).)

**(f) “a second RLC section that is coupled to the second inductor coil;”**

110. In my opinion, Marques in combination with Lee discloses or suggests this claim feature. Lee discloses in annotated Figure 12.10 below, a second RLC section coupled to the second inductor coil. (*Id.*) While the RLC section is not directly coupled to the second inductor coil, they are coupled via intermediary components.

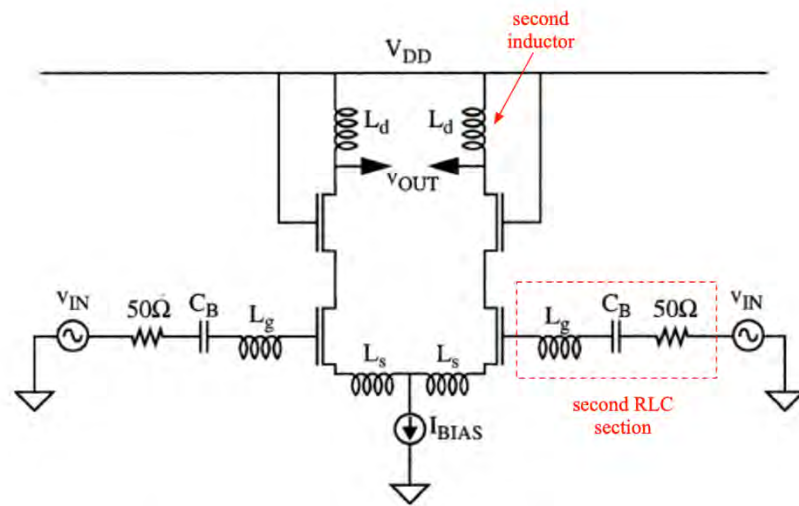


**FIGURE 12.10.** Differential LNA (simplified).

(*Id.*, Figure 12.10 (annotated).)

(g) “an output that is coupled to the first inductor coil,  
the second inductor coil, the first transistor, and the  
second transistor.”

111. In my opinion, Marques in combination with Lee discloses or suggests this claim feature. Lee discloses in annotated Figure 12.10 below, an output ( $V_{out}$ ) coupled to the first inductor coil, the second inductor coil, the first transistor, and the second transistor. (*Id.*)

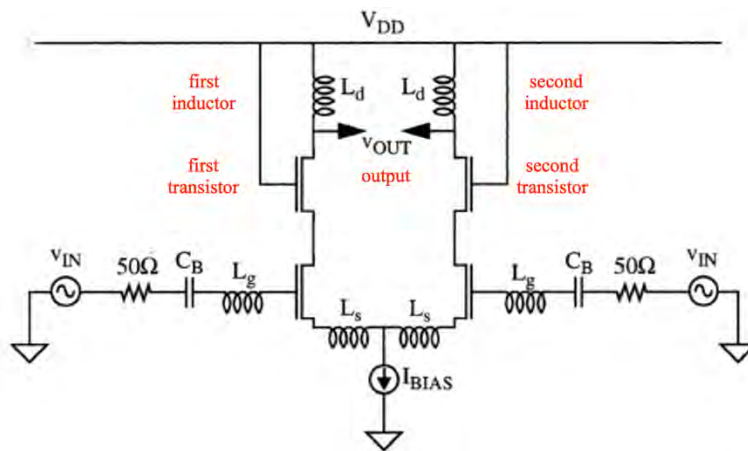


**FIGURE 12.10.** Differential LNA (simplified).

(*Id.*, Figure 12.10 (annotated).)

### 3. Claim 12

- (a) “The amplifier of claim 11 wherein a first polarity of the first inductor coil is opposite to a second polarity of the second inductor coil.”

112. In my opinion, Marques in combination with Lee discloses or suggests this claim feature. Inductors do not have a functional polarity. The polarity of an inductor is a reference to indicate the direction of current flow. With this understanding, Marques clearly discloses in annotated Figure 7 above a first polarity of the first inductor 16 is opposite to a second polarity of the second inductor coil 18 due to the opposite flow of current in each inductor. (Ex. 1005, 6:5-10.) A POSITA would have been motivated to use the inductor structure of Marques in the DLNA of Lee in order to reduce interference between closely positioned inductors.

4. Claim 13

(a) “The amplifier of claim 11 wherein the first and second inductor coils are spiral structured.”

113. In my opinion, Marques in combination with Lee discloses or suggests this claim feature. Marques discloses in annotated Figure 7 above rectangular spiral inductor coils. (*Id.*, Figure 7.) Further, Lee discloses that “the most widely used on-chip inductor is the planar spiral, which can assume many shapes.” (Ex. 1007, 136.) Common inductor spiral shapes are shown in Lee’s Figure 4.21 below which includes a square shape. (*Id.*, 137.) Lee further discloses that the choice of shape is more often made on the basis of convenience or habit than anything else. (*Id.*, 136.)

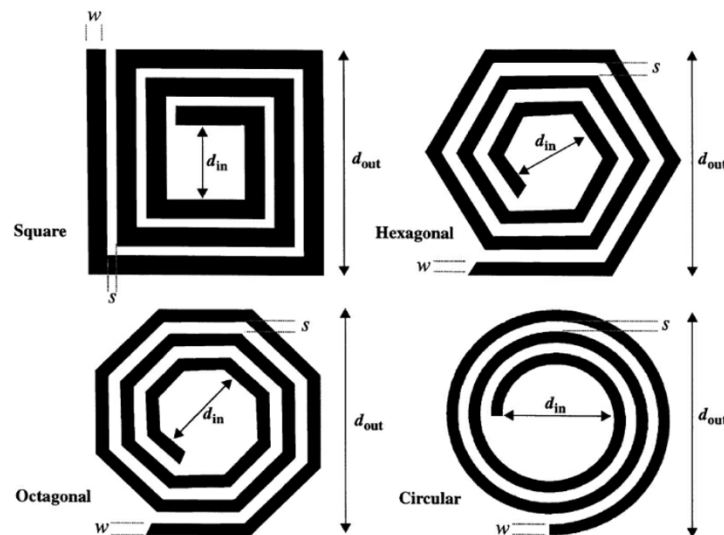


FIGURE 4.21. Planar spiral inductors.

(*Id.*, FIGURE 4.21.)

114. In my opinion, in view of Lee, spiral inductor structures were well known to persons of ordinary skill in the art and were widely used in RF apparatuses. Marques and Lee are references in the same field and both disclose inductor structures in the context of RF apparatuses. Therefore, in my opinion, a POSITA could look to Lee to adjust the spiral structure of Marques to any common spiral structure based on desired design features of the circuit or personal preference.

**5. Claim 14**

**(a) “The amplifier of claim 11 wherein the first and second inductor coils are octagonal structured.”**

115. In my opinion, Marques in combination with Lee discloses or suggests this claim feature. Marques discloses in annotated Figure 7 above rectangular spiral inductor coils. (Ex. 1005, Figure 7.) Further, Lee discloses that “the most widely used on-chip inductor is the planar spiral, which can assume many shapes.” (Ex. 1007, 136.) Common inductor spiral shapes are shown in Lee’s Figure 4.21 above which includes an octagonal shape. (*Id.*, 137.) Lee further discloses that the choice of shape is more often made on the basis of convenience or habit than anything else. (*Id.*, 136.)

116. Therefore, in my opinion, a POSITA could look to Lee to adjust the spiral structure of Marques to any common spiral structure such as octagonal based on desired design features of the circuit or personal preference.

**6. Claim 15**

**(a) “The amplifier of claim 11 wherein a change in magnitude of the first magnetic field causes a change in magnitude of the second magnetic field.”**

117. In my opinion, Marques in combination with Lee discloses or suggests this claim feature. As discussed previously, when a current flows through an inductor, a magnetic field proportional to the current is produced. In order to change the first magnetic field, the first current would need to change, meaning the voltage source supply would change. With a change in the voltage supply, the second current would also change causing a change in the second magnetic field.

**7. Claim 16**

**(a) “The amplifier of claim 1 wherein a change in magnitude of the second magnetic field causes a change in magnitude of the first magnetic field.”**

118. In my opinion, Marques in combination with Lee discloses or suggests this claim feature. Similar to the reasoning above, in order to change the second

magnetic field, the second current would need to change, meaning the voltage source supply would change. With a change in the voltage supply, the first current would also change causing a change in the first magnetic field.

**8. Claim 19**

**(a) “The method of claim 17 wherein the first and second magnetic coils are structured in an octagonal configuration.”**

119. In my opinion, Marques in combination with Lee discloses or suggests this claim feature. As discussed above, Marques discloses in Figure 6 above, a first and second inductor having a hexagonal shape. (Ex. 1005, 5:29-30.) Lee discloses that “the most widely used on-chip inductor is the planar spiral, which can assume many shapes.” (Ex. 1007, 136.) Common inductor spiral shapes are shown in Lee’s Figure 4.21 above which includes an octagonal shape. (*Id.*, 137.) Lee further discloses that the choice of shape is more often made on the basis of convenience or habit than anything else. (*Id.*, 136.)

120. In my opinion, in view of Lee, octagonal inductor structures were well known to persons of ordinary skill in the art and were widely used in RF apparatuses. Marques and Lee are references in the same field and both disclose inductor structures in the context of RF apparatuses. Therefore, in my opinion, a person of

ordinary skill in the art could look to Lee to adjust the inductor structure of Marques Figure 6 to an octagonal structure based on desired design features of the circuit or personal preference.

**D. Menegoli Discloses the Features of Claims 1, 2, 4, 5, and 7-10**

121. In my opinion, Menegoli discloses all of the features of claims 1, 2, 4, 5, and 7-10.

**1. Claim 1**

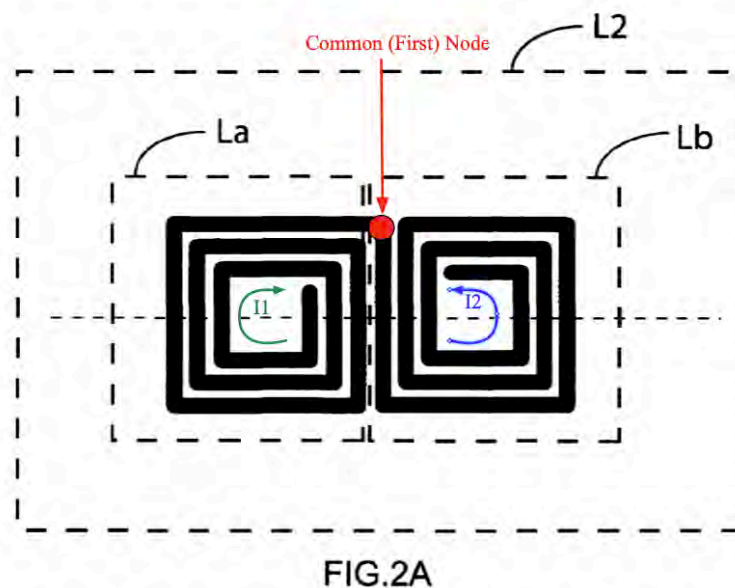
**(a) “A multiple inductor array comprising:”**

122. Under the assumption that the preamble is a claim limitation, in my opinion, Menegoli discloses this claim feature. Menegoli discloses inductor elements that include two adjacent inductors or an array of four inductors. (Ex. 1008, 5:44-46 (“an inductor can be formed as a series of two inductors”), 7:38-39 (“FIG. 5 shows an array of four planar spiral inductors”).) As such, Menegoli discloses a multiple inductor array.

**(b) “a first node that receives a first current and a second current;”**

123. In my opinion, Menegoli discloses this claim feature. Menegoli discloses in annotated Figure 2A below, a common node between series coupled inductors La and Lb. (*Id.*, 8:16-24.) Current (I1) is flowing clockwise in inductor

La, and current (I2) flows counterclockwise in inductor Lb. (*Id.*) A series connection is defined by two branches joined by a common node. The first (common) node between these paths can be viewed as the point where I1 and I2 meet (i.e., the first node receives a first and second current).



(*Id.*, FIG. 2A (annotated).)

- (c) “a first inductor coil, coupled to the first node and to a second node, that communicates the first current in a clockwise direction and generates a first magnetic field;”

124. In my opinion, Menegoli discloses this claim feature. Menegoli discloses in annotated Figure 2A below, a first inductor La coupled to the first node

(as discussed above, there is a common node between the first and second inductors)  
and to a second node due to the series connection of two inductors La and Lb. (*Id.*)

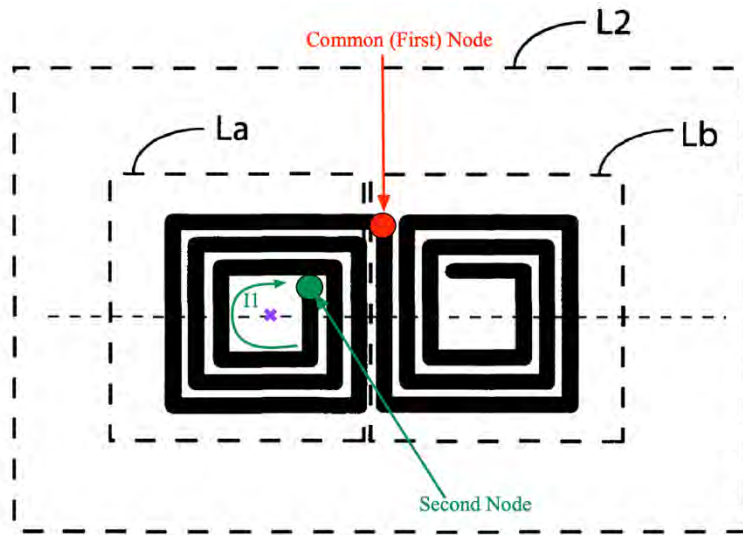


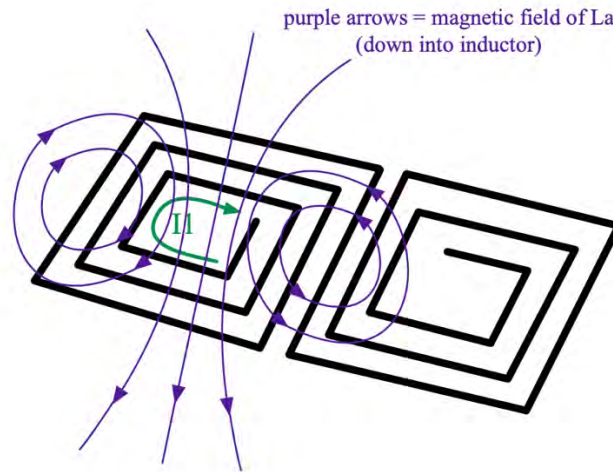
FIG.2A

(*Id.*, FIG. 2A (annotated).)

125. Menegoli further discloses two inductors with anti-phase magnetic fields adjacent to each other. (*Id.*, 8:40-41.) Menegoli further discloses that if the current is flowing clockwise in inductor La, then the current flows counterclockwise in inductor Lb current such that the radiated energy is contained. (*Id.*, 8:18-22, 8:31-33.) As such, according to the right-hand rule, the current I1 flowing in inductor La generates a magnetic field (i.e., a first magnetic field) directed into the plane of the paper (as indicated by the purple “x” in annotated Figure 2A above).

126. Menegoli Figure 2A has been redrawn below to show the inductor structure at an angle to view magnetic field lines. As shown, the clockwise current

I1 in inductor La generates a magnetic field (purple arrows) flowing down into the inductor.



(*Id.*, FIG. 2A (redrawn, annotated).)

- (d) “a second inductor coil, coupled to the first node and to a third node, that communicates the second current in a counter clockwise direction and generates a second magnetic field having an opposing orientation to the first magnetic field; and”

127. In my opinion, Menegoli discloses this claim feature. Menegoli discloses in annotated Figure 2A below, a second inductor Lb coupled to the first node (as discussed above, there is a common node between the first and second inductors) and to a third node due to the series connection of two inductors La and Lb. (*Id.*, 8:16-22.)

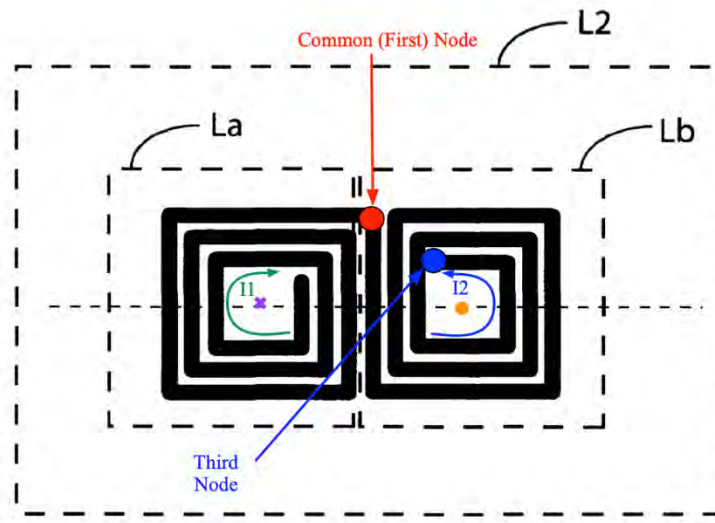


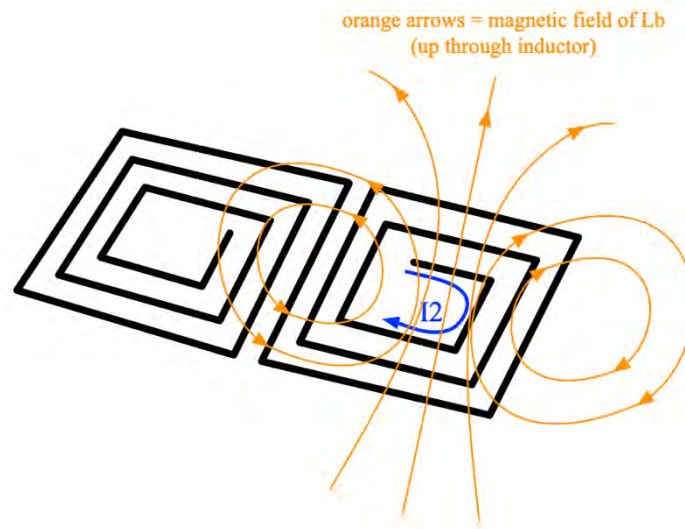
FIG.2A

(*Id.*, FIG. 2A (annotated).)

128. Menegoli further discloses two inductors with anti-phase magnetic fields adjacent to each other. (*Id.*, 8:40-41.) Menegoli further discloses that if the current is flowing clockwise in inductor La, then the current flows counterclockwise in inductor Lb current such that the radiated energy is contained. (*Id.*, 8:18-22, 8:31-33.) As illustrated in annotated Figure 2A above, according to the right-hand rule, the current I2 flowing in inductor Lb generates a magnetic field (i.e., a second magnetic field) directed out of the plane of the paper (as indicated by the orange dot).

129. Menegoli Figure 2A has been redrawn below to show the inductor structure at an angle to view magnetic field lines. As shown, the counterclockwise current I2 in inductor Lb generates a magnetic field (orange arrows) flowing

upwards out through the inductor. As such, Menegoli discloses a second inductor coil coupled to a first and third node that communicates the second current in a counterclockwise direction and generates a second magnetic field having an opposing orientation to the first magnetic field.

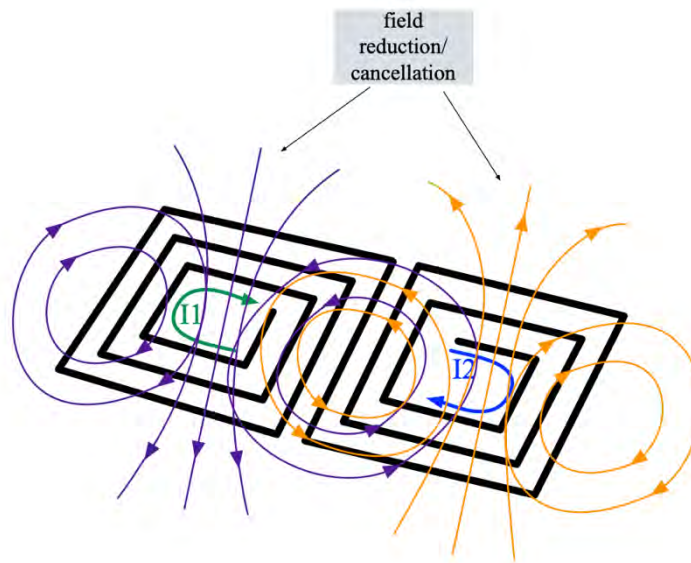


(*Id.*, FIG. 2A (redrawn, annotated).)

(e) “wherein the first magnetic field and the second magnetic field at least partially cancel at an interference point.”

130. In my opinion, Menegoli discloses this claim feature. Menegoli discloses that if two inductors with anti-phase magnetic fields are adjacent to each other, a portion of the magnetic field of the other and the total resultant magnetic field around the inductors is reduced. (*Id.*, 5:38-43.) As such, Menegoli discloses a

first and second magnetic field that cancel at an interference point (e.g., a point around the inductors). As illustrated in redrawn, annotated Figure 2A below, at least a portion of the opposing magnetic fields in inductors La and Lb will cancel based on the interference of the oppositely oriented fields. (*Id.*)



(*Id.*, FIG. 2A (redrawn, annotated).)

## 2. Claim 2

(a) **“The array of claim 1 wherein the first inductor coil and the second inductor coil are spiral structures.”**

131. In my opinion, Menegoli discloses this claim feature. Menegoli explicitly discloses a structure consisting of anti-phase *spiral* inductors. (*Id.*, 5:47-62, 8:15-16.) Therefore, Menegoli discloses that first and second inductor coils are spiral structures.

**3. Claim 4**

- (a) “The array of claim 1 wherein a change in magnitude of the first magnetic field causes a change in magnitude of the second magnetic field.”**

132. In my opinion, Menegoli inherently discloses this claim feature. As discussed in the technical background section of this Declaration, when a current flows through an inductor, a magnetic field proportional to the current is produced. Therefore, because current flows through inductors La and Lb (as shown in annotated Figure 2A above), a change in the current would change the magnetic fields produced by both inductors. To cause a change in the first magnetic field, a change in current applied to the entire structure would need to occur which would cause a change in the second magnetic field as well.

**4. Claim 5**

- (a) “The array of claim 1 wherein a change in magnitude of the second magnetic field causes a change in magnitude of the first magnetic field.”**

133. In my opinion, Menegoli inherently discloses this claim feature. As discussed above, when a current flows through an inductor, a magnetic field proportional to the current is produced. Therefore, because current flows through

inductors La and Lb (as shown in annotated Figure 2A above), a change in the current would change the magnetic fields produced by both inductors. To cause a change in the second magnetic field, a change in current applied to the entire structure would need to occur which would cause a change in the first magnetic field as well.

**5. Claim 7**

**(a) “The array of claim 1 wherein the first and second currents flow in opposing directions.”**

134. In my opinion Menegoli discloses this claim feature. Menegoli discloses that the structure includes two spiral formed interconnection structures La and Lb where when the current is flowing clockwise in spiral inductor La, the current is flowing counter-clockwise into the spiral inductor Lb. (*Id.*, 8:18-21.) As such, Menegoli discloses that first and second currents flow in opposing directions.

**6. Claim 8**

- (a) “The array of claim 1 wherein the magnitudes of the first and second currents are related so that a change in the first current causes a corresponding change in the second current in order to cause a reactionary interference cancellation.”**

135. In my opinion Menegoli inherently discloses this claim feature. As discussed above, when a current flows through an inductor, a magnetic field proportional to the current is produced. Because current flows through inductors La and Lb (as currents I1 and I2 in annotated Figure 2A above), a change in current to the structure would change both the first and second currents through the inductors. Therefore, to change the current through one inductor, a change in current needs to occur which ultimately changes the current in the other inductor and produces opposing magnetic fields proportional to the new current (i.e., reactionary interference cancellation).

**7. Claim 9**

- (a) “The array of claim 1 further comprising a third inductor coil that generates a third magnetic field that cancels at least a portion of the first magnetic field.”**

136. In my opinion, Menegoli discloses this claim feature. Menegoli discloses in Figure 5 below, an array of four planar spiral inductors electrically connected in series to form alternate phase magnetic fields. (*Id.*, 9:45-48.) Menegoli further discloses that the combination of the alternate magnetic fields (indicated in Figure 5 as N for North and S for South) reduces undesirable stray magnetic fields. (*Id.*) Therefore, if the first inductor coil is the inductor coil on the top left of Figure 5 below with the South magnetic field orientation, then the third inductor coil is the bottom left inductor coil with the North magnetic field orientation (i.e., where the third magnetic field cancels at least a portion of the first magnetic field by being anti-phase).

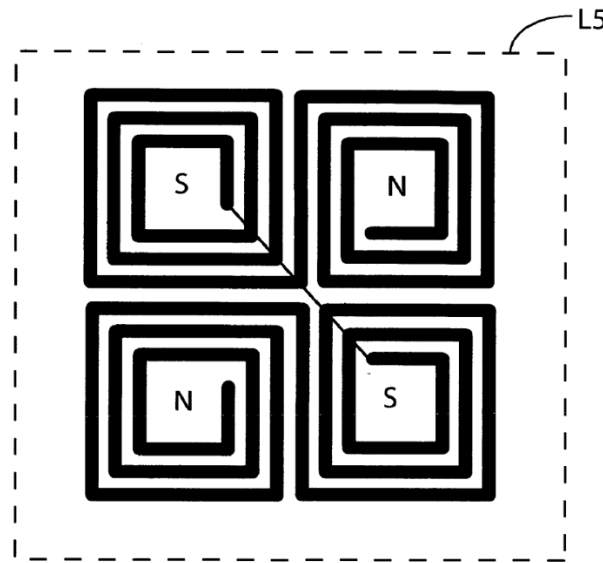


FIG.5

(*Id.*, FIG. 5.)

**8. Claim 10**

- (a) “The array of claim 1 further comprising a third inductor coil that generates a third magnetic field that cancels at least a portion of the second magnetic field.”**

137. In my opinion, Menegoli discloses this claim feature. Menegoli discloses in Figure 5 above, an array of four planar spiral inductors electrically connected in series to form alternate phase magnetic fields. (*Id.*, 9:45-52.) Menegoli further discloses that the combination of the alternate magnetic fields (indicated in Figure 5 above as N for North and S for South) improves undesirable stray magnetic fields. (*Id.*) Therefore, if the second inductor coil is the inductor coil on the top right

of Figure 5 above with the North magnetic field orientation, then the third inductor coil is the bottom right inductor coil with the South magnetic field orientation (i.e., where the third magnetic field cancels at least a portion of the second magnetic field by being anti-phase).

**E. Menegoli Discloses or Suggests the Features of Claim 3**

138. In my opinion, Menegoli discloses or suggests the features of Claim 3. While the limitations of claim 3 are not explicitly disclosed by Menegoli, the differences between claim 3 and Menegoli are such that the claimed invention as a whole would have been obvious before the time of the alleged invention to a POSITA.

139. Menegoli is analogous art to the '330 Patent because Menegoli and the '330 Patent are in the same field of endeavor. Menegoli discloses an inductor structure that eliminates magnetic losses when driven at a high frequency. (Ex. 1008, 5:23-43.) Similarly, the '330 Patent discloses an inductor design to be used in high frequency applications where magnetic fields at least partially cancel at an interference point. (Ex. 1001, 1:17-36, 2:16-30.)

140. A POSITA would have been motivated to modify the shape of the inductor structure of Menegoli based on what was generally known in the art at the time of the alleged invention and would have done so with a reasonable expectation

of success. Menegoli discloses that the conventional means of creating an inductor in an integrated circuit is the spiral inductor. (Ex. 1008, 3:16-18.) Menegoli further discloses that the length, shape, and number of spiral turns of the planar spiral inductors may vary without modifying the spirit and scope of the invention. (*Id.*, 9:59-10:3.) Further, the goal of Menegoli is to reduce stray magnetic fields while increasing mutual inductance. (*Id.*, 5:30-55.) Because an octagonal structure has better inductance than a square, a POSITA would have been motivated to improve the inductance of Menegoli by adjusting the shape of the inductors from a square to an octagon. (Ex. 1007, 136.) Planar spiral inductor shapes were well known in the art and usually selected based on personal preference or design tools. (Ex. 1007, 136.) A shape modification may result in a slight performance improvement and therefore adjusting the shape to improve performance or enhance convenience would result in a reasonable expectation of success. (*Id.*)

**1. Claim 3**

**(a) “The array of claim 1 wherein the first inductor coil  
and the second inductor coil are octagonal  
structures.”**

141. In my opinion, Menegoli discloses or suggests this claim feature. As discussed above, inductor coils having octagonal structures were widely known to a

POSITA at the time of the alleged invention. Octagonal and circular spirals are favored planar spiral shapes with slightly better performance than other shapes. (Ex. 1007, 136.)

142. Therefore, in my opinion, a POSITA would find it obvious, based on what was known in the art at the time of the alleged invention to adjust the square spiral structures of Menegoli to an octagonal structure based on desired design features of the circuit, layout tools, and/or performance requirements.

**F. Menegoli in Combination with Lee Discloses or Suggests the  
Features of Claim 3**

143. In my opinion, Menegoli in combination with Lee discloses or suggests the features recited in claim 3. Menegoli is analogous art to the '330 Patent because Menegoli and the '330 Patent are in the same field of endeavor. Menegoli discloses an inductor structure that eliminates magnetic losses when driven at a high frequency. (Ex. 1008, 5:23-43.) Similarly, the '330 Patent discloses an inductor design to be used in high frequency applications where magnetic fields at least partially cancel at an interference point. (Ex. 1001, 1:17-36, 2:16-30.)

144. Lee is also analogous art to the '330 Patent because Lee and the '330 Patent are in the same field of endeavor. Lee provides discussion and schematics for common IC components and circuitry such as differential low noise amplifiers

(DLNAs) at the time of the alleged invention. (Ex. 1007, 136-137, 388.) Lee discusses that high frequency amplifiers face serious constraints due to “ever-present parasitic capacitances and inductances.” (Ex. 1007, 270.) Similarly, the ’330 Patent discloses that the impact of cross-coupling or crosstalk is a more significant issue in circuits operating at high frequencies. (Ex. 1001, 1:16-21.) The counter wound inductor structure of the ’330 Patent may be used in a DLNA to minimize crosstalk and maintain the reliability of the circuit. (Ex. 1001, 2:42-50.)

145. A POSITA would have been motivated to modify Menegoli in view of Lee and would have done so with a reasonable expectation of success. Menegoli discloses that the conventional means of creating an inductor in an integrated circuit is the spiral inductor. (Ex. 1008, 3:16-18.) Menegoli further discloses that the length, shape, and number of spiral turns of the planar spiral inductors may vary without modifying the spirit and scope of the invention. (*Id.*, 9:59-10:3.) Further, the goal of Menegoli is to reduce stray magnetic fields while increasing mutual inductance. (*Id.*, 5:30-55.) Lee discloses that an octagonal structure has better inductance than a square and that planar spiral inductor shapes were well known in the art and usually selected based on personal preference or design tools. (Ex. 1007, 136.). As such, a POSITA would have been motivated to improve the inductance of Menegoli by adjusting the shape of the inductors from a square to an octagon as

discussed by Lee. A shape modification may result in a slight performance improvement and therefore adjusting the shape to improve performance or enhance convenience would result in a reasonable expectation of success. (*Id.*)

146. A POSITA would have a reasonable expectation of success in modifying the inductor structure of Menegoli in accordance with common inductor structures of Lee because doing so would improve aspects of Menegoli and/or provide convenience to a circuit designer. Therefore, in my opinion, a POSITA would have been motivated to combine known inductor shapes Lee into the circuitry of Menegoli in order to improve the inductor structure of Menegoli.

**1. Claim 3**

**(a) “The array of claim 1 wherein the first inductor coil  
and the second inductor coil are octagonal  
structures.”**

147. In my opinion, Menegoli in combination with Lee discloses or suggests this claim feature. While Menegoli does not explicitly disclose inductors having an octagonal structure, Lee discloses that “the most widely used on-chip inductor is the planar spiral, which can assume many shapes.” (Ex. 1007, 136.)

148. Common inductor spiral shapes are shown in Lee’s Figure 4.21 below which includes an octagonal shape. (*Id.*, 137.) Lee further discloses that the

octagonal spirals are moderately better (i.e., have better inductance) than squares. (*Id.*, 136.) The goal of Menegoli is to reduce stray magnetic fields while increasing mutual inductance. (Ex. 1008, 5:30-55.) Because an octagonal structure has better inductance than a square, a POSITA would have been motivated to improve the inductance of Menegoli by adjusting the shape of the inductors from a square to an octagon. (Ex. 1007, 136.)

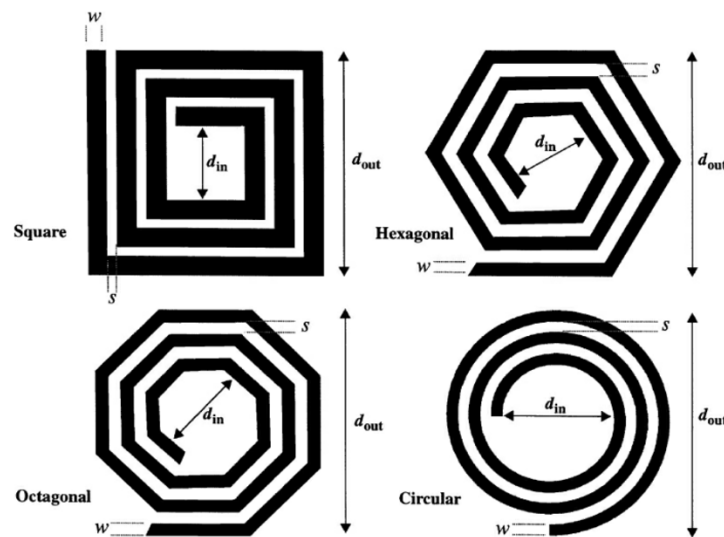


FIGURE 4.21. Planar spiral inductors.

(*Id.*, FIGURE 4.21.)

149. In my opinion, octagonal inductor structures were well known to persons of ordinary skill in the art at the time of the alleged invention and were widely used in RF apparatuses as evidenced by Lee. Therefore, in my opinion, a POSITA could look to Lee to adjust the spiral structures of Menegoli to an octagonal structure to improve the inductance of the structure.

## **XI. CONCLUSION**

150. In summary, it is my opinion that all of the features of claims 1-20 of the '330 Patent are disclosed or suggested by the prior art.

151. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 19 of the United States Code.



Dated: Nov. 1, 2023

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Sayfe Kiaei, Ph.D.